

SCHEME OF EXAMINATION

&

SYLLABUS

for

B.Tech (PETROLEUM ENGINEERING)
(Effective from the session: 2014-15)



Uttarakhand Technical University, Dehradun

UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN
COURSE STRUCTURE AND EVALUATION SCHEME, B.Tech (P.E.)
(Effective from the Session: 2014-15)
Year –I, Semester - I

S.No	Subject	Course Code	Periods			EVALUATION SCHEME						Credit
						SESSIONAL EXAM			External Exam	Subject Total		
			L	T	P	CT	TA	Total				
1	Mathematics - I	TMA 101	3	1	0	30	20	50	100	150	4	
2	Engg. Physics/ Engg. Chemistry	TPH 101 / TCY 101	3	1	0	30	20	50	100	150	4	
3	Basic Technical Communication — I	THM 101	3	0	2	40	10	50	100	150	3	
4	Basic Electrical Engineering / Mechanical Engineering	TEE 101 / TME 101	3	1	0	30	20	50	100	150	4	
5	Fundamentals of C o m p u t e r & Programming / Fundamentals of Electronic Engineering	TCS 101 / TEC 101	3	1	0	30	20	50	100	150	4	
*	Environmental Studies	TES 101	2	0	0	-	-	-	-	-	-	
Practical												
1	Physics/ Chemistry	PPH 101 / PCY101	0	0	2	-	-	25	25	50	2	
2	Basic Electrical Engineering / Basic Mechanical Engineering	PEE 101 / PME 101	0	0	2	-	-	25	25	50	2	
3	Fundamentals of C o m p u t e r & Programming / Fundamentals of Electronic Engineering	PCS 101 / PEC 101	0	0	2	-	-	25	25	50	2	
4	Workshop Practice/ Engineering Drawing	PWS 101/ PED 101	0	0	2	-	-	25	25	50	2	
		TOTAL	-	-	-					950	27	

UTTRAKHANDTECHNICAL UNIVERSITY, DEHRADUN
COURSE STRUCTURE AND EVALUATION SCHEME B.Tech (P.E.)
(Effective from the session: 2014-15)
Year: I, Semester-II

S.No	Course Code	Subject	Periods			EVALUATION SCHEME					Subject Total	Credit Points
						SESSIONAL EXAM			External Exam			
			L	T	P	CT	TA	Total				
1	TMA 201	Mathematics - II	3	1	0	30	20	50	100	150	4	
2	TCY 201 / TPH 201	Chemistry / Physics	3	1	0	30	20	50	100	150	4	
3	THM 201	Advanced Technical Communication	3	0	2	30	20	50	100	150	3	
4	THE 201 / TEE 201	Basic Mechanical Engineering / Electrical Engineering	3	1	0	30	20	50	100	150	4	
5	TEC 201 / TCS 201	Fundamentals of Electronic Engineering / Fundamentals Computer & Programming	3	1	0	30	20	50	100	150	4	
*	TES 201	Environmental Studies	2	0	0	30	20	50	-	50	-	
Practical												
1	PCY 201 / PPH 201	Chemistry / Physics	0	0	2	-	-	25	25	50	2	
2	PME 201 / PEE 201	Basic Mechanical Engineering / Electrical Engineering	0	0	2	-	-	25	25	50	2	
3	PEC 201 / PCS 201	Fundamentals of Electronic Engineering / Fundamentals Computer & Programming	0	0	2	-	-	25	25	50	2	
4	PED201/P WS 201	Engineering Drawing / Workshop Practice	0	0	2	-	-	25	25	50	2	
		TOTAL	-	-	-	-	-			1000	27	

UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN
COURSE STRUCTURE AND EVALUATION SCHEME, B.Tech (P.E.)
 (Effective from the Session: 2014-15)
 Year: II, Semester-III

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Applied Geology-I	TPE-301	30	70	100	2	0	0	2
2	Fluid Mechanics & Machinery	TPE-302	50	100	150	3	1	0	3
3	Chemical Thermodynamics	TPE-303	30	70	100	2	1	0	2
4	Heat Transfer Process	TPE-304	50	100	150	3	1	0	3
5	Engineering Mathematics-III	TMA-315	50	100	150	3	1	0	3
6	Ground Surveying	TCE-317	50	100	150	3	1	0	3
	Practical								
1	Fluid Mechanics & Machinery Lab	PPE-351	25	25	50	0	0	2	1
2	Heat Transfer Process Lab	PPE-352	25	25	50	0	0	2	1
3	Ground Surveying Lab	PCE-355	25	25	50	0	0	2	1
4	Value Addition Training-I	VAT-351	50	50	100	0	0	2	2
TOTAL					1050				21

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COURSE STRUCTURE AND EVALUATION SCHEME, B.Tech (P.E.)
(Effective from the Session: 2014-15)
Year: II, Semester-IV

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Applied Geology -II	TPE-401	50	100	150	3	0	0	3
2	Elements of Reservoir Engineering	TPE-402	50	100	150	3	1	0	3
3	Petroleum Exploration Methods	TPE-403	50	100	150	3	1	0	3
4	Petroleum Production Operation-I	TPE-404	50	100	150	3	1	0	3
5	Numerical Methods in Engineering	TPE-405	50	100	150	3	1	0	3
6	Oil & Gas Well Drilling Technology & Well Completion	TPE-406	50	100	150	3	1	0	3
	Practical								
1	Petroleum Engineering Lab -I	PPE-451	25	25	50	0	0	2	1
2	Numerical Methods Lab	PMA-452	25	25	50	0	0	2	1
3	Applied Geology Lab	PPE-453	25	25	50	0	0	2	1
4	Value Addition Training-II	VAT-451	50	50	100	0	0	2	2
TOTAL					1150				23

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COURSE STRUCTURE AND EVALUATION SCHEME, B.Tech (P.E.)
(Effective from the Session: 2014-15)
Year: III, Semester-V

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Petroleum Production Operation-II	TPE-501	50	100	150	3	1	0	3
2	Applied Petroleum Reservoir Engineering	TPE-502	50	100	150	3	1	0	3
3	Unit Operations	TPE-503	50	100	150	3	1	0	3
4	Formation Evaluation	TPE-504	50	100	150	3	0	0	3
5	Drilling Fluids and Cementation	TPE-505	50	100	150	3	1	0	3
6	Non Conventional Petroleum Resources	TPE-506	30	70	100	2	0	0	2
	Practical								
1	Petroleum Engineering Lab- II	PPE-551	25	25	50	0	0	2	1
2	Unit Operations Lab	PPE-552	25	25	50	0	0	2	1
3	Aptitude Building -I	THM-531	50	50	100	2	0	0	2
4	Industrial Tour	PPE-553	25	25	50	0	0	0	1
TOTAL					1100				22

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(Effective from the Session: 2014-15)
Year: III, Semester-VI

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Offshore Drilling and Production Practices	TPE-601	50	100	150	3	1	0	3
2	Petroleum Engineering Design -I	TPE-602	50	100	150	3	1	0	3
3	Natural Gas Engineering	TPE-603	50	100	150	3	1	0	3
4	Enhanced Oil Recovery Methods	TPE-604	30	70	100	2	1	0	2
5	Oil and Gas Well Testing	TPE-605	50	100	150	3	1	0	3
6	Principles of Management	THU -608	30	70	100	2	0	0	2
	Practical								
1	Petroleum Engineering Lab-III	PPE-651	25	25	50	0	0	2	1
2	Project-I	PPE-652	50	50	100	0	0	4	2
3	Composite Viva Voce -I	PPE-653	25	25	50	0	0	0	1
4	Aptitude Building-II	THM-631	50	50	100	2	0	0	2
TOTAL					1100				22

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Year: IV, Semester-VII

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Petroleum Engineering Design-II	TPE-701	50	100	150	3	1	0	3
2	Reservoir Simulation	TPE-702	50	100	150	3	1	0	3
3	Petroleum Refining and Petrochemicals	TPE-703	50	100	150	3	0	0	3
4	Professional Development: Campus to Corporate	TPE-704	50	100	100	2	0	0	2
5	Elective I (any one)*	?	50	100	150	3	1	0	3
	Practical								
1	Project-II	PPE-751	50	50	100	0	0	4	2
2	Seminar	PPE-752	25	25	50	0	0	2	1
3	Industrial Training Evaluation	PPE-753	50	50	100	0	0	2	2
4	Extra Academic Activities	PPE-754	25	25	50	0	0	2	1
TOTAL					1000				20

***Elective I (any one)**

1. Remote Sensing & GIS (TCE-071)
2. Fundamentals of Rocks Mechanics(TCE-072)
3. Disaster Management(TPE-071)
4. Corrosion Engineering(TPE-072)

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Year: IV, Semester-VIII

Sr. No	Subject	Subject code	Marks			Periods			Credit Points
			Internal	External	Total	L	T	P	
	Theory								
1	Health ,Safety and Environmental Management in Petroleum Operations	TPE 801	50	100	150	3	0	0	3
2	Industrial Economics	TPE 802	30	70	100	2	1	0	2
3	Elective-II (any one)**		50	100	150	3	0	0	3
4	Elective –III (any one)***		50	100	150	3	0	0	3
5	Human Values and Ethics	TPE-803	50	100	150	3	0	0	3
	Practical								
1	Project-III	PPE-851	100	100	200	0	0	4	4
2	Seminar	PPE-852	25	25	50	0	0	2	1
3	Composite Viva-Voce II	PPE-853	25	25	50	0	0	2	1
TOTAL					1000				20

**** Elective II (any one)**

1. Well Stimulation: TPE-081
2. Fluid Flow through Porous Media: TPE-082

***** Elective III (any one)**

1. Oil and Gas Transportation System: TPE-083
2. Oil and Gas Marketing and Resource Management: TPE-084

MATHEMATICS—I (TMA -101)

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3 1 0

UNIT-1

Matrices

(10L)

Elementary row and column transformations Rank of matrix, linear dependence, Consistency of linear system of equations Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors Diagonalization, Complex and unitary matrices.

UNIT-2

Differential Calculus-I (9L) Leibnitz theorem, Partial Differentiation, Euler's theorem, Change of variables Expansion of functions of several variables.

UNIT-3

Differential Calculus-I I (9L) Jacobian, Approximations and errors, Extrema of functions of several variables, Lagrange method of multipliers

UNIT-4

Multiple Integrals: Double and triple integrals, Change of order, Change of variables, beta and gamma functions, Application to area, volume, Dirichlet integral and applications.

Vector Calculus

(6L)

Point functions Gradient, divergence and curl of a vector and their physical interpretation, Line, surface and volume integrals, Green, Stokes and Gauss divergence theorem.

References :

Advanced Engineering Mathematics, Kreyszig, Wiley India

A Text book of Engineering Mathematics (Vol .1) by Peter V. O'Neil, Cengage Learning

ENGINEERING PHYSICS (TPH-101/201)

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3 1 0

(8L)

UNIT-I

Relativistic Mechanics:

Inertial and Non-inertial Frames Postulates of Special Theory of Relativity, Galilean and Lorentz Transformation, Length Contraction and Time Dilation, Addition of Velocities, Mass Energy Equivalence and Variation of Mass with Velocity. Radiation: Kirchoffs Law, Stefan's law (only statement), Energy spectrum of Blackbody Radiation, Compton Effect.

UNIT II

(8L)

Interference: Coherent Sources Conditions of Interference, Fresnel's Biprism Experiment, Displacement of Fringes, Interference in Thin Films — Wedge Shaped Film, Newton's Rings. Diffraction: Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Grating.

UNIT III

(7L)

Polarization: Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays Nicol Prism, Production and Analysis of Plane, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation, Polarimeter. Laser: Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser.

UNIT IV

(8L)

Electromagnetic - Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms Electromagnetic Wave Propagation in Free Space and Conducting Media, Pointing Theorem. Magnetic Properties of Materials: Basic Concept of Para- , Dia and Ferro-Magnetism, Langevin's Theory of Diamagnetism, Phenomenon of H ysteresi s and Its Applications

UNIT-V

(9L)

Superconductivity-

Essential properties of superconductors (zero resistivity), London equations, penetration depth and coherence length, Meissner effect, critical field , critical current Isotope effect, heat capacity, Type I and Type II superconductors Characteristics of superconductors in superconducting state, applications of superconductors. Wave Mechanics : Wave Particle Duality, de Broglie Concept of Matter Waves, Heisenberg Uncertainty Principle, Schrödinger Wave Equation and Its Applications: Particle in a Box.

References :

Introduction to Special theory of Relativity Robert Resnick

— Wiley India Physics of Atoms ,Wehr Richards & Adia

Fundamentals of Physics, Halliday, Wiley India

Engineering Electromagnetics, Wi I I am Hayt, i Ed.(TMH)

Ashutosh Asthana, Engg. Physics BS Publication, Hyderabad

ENGINEERING CHEMISTRY (TCY -101/201)

L T P

3 1 0

UNIT -1 GENERAL & ORGANIC CHEMISTRY

(8L)

Molecular orbital diagram of diatomic molecules, valence bond theory & molecular orbital Theory linear combination of atomic orbitals, hybridization, hydrogen bonding, band theory of solids, liquid crystals with their classification applications Bragg's Law, Fullerenes & their application, Nature of organic molecules, attacking reagents, inductive effect, electromeric, mesomeric (resonance) effect, hyper conjugation, reaction intermediates types of organic reaction (substitution, addition, elimination reaction & organic rearrangements), Saytzeff's rule, organic name reactions (cannizzaro's reaction, aldol condensation, Pinnacol-pinnacol rearrangement, Beckmann's rearrangement, Hoffmann's rearrangement), Optical isomerism & confirmations, E-Z nomenclature, R-S configuration.

UNIT -II PHYSICAL & WATER CHEMISTRY

(10L)

Rate of reaction, order & molecularity of reaction, Zero order, First Order, Second order reaction, steady state approximation, concept of activation energy, energy barrier, cell potential, liquid junction potential, conductance & its variation with dilution, Transport no. Kohlraush's Law and its application, pH, buffer solution, calculation of pH of buffer mixture solubility & solubility Product, Nernst distribution law & its application, corrosion, its type, Mechanism & control, Theory of Electrochemical corrosion. Hardness of water, boiler feed water, Softening of water (Calgon Process, Zeolite process, Lime Soda process & Ion exchange process), Reverse osmosis, treatment of boiler feed water.

UNIT - III CHEMISTRY OF ENGINEERING MATERIALS

(7L)

Introduction & classification of polymers, Types of Polymerization, bulk solution, suspension & emulsion, copolymers, vulcanization, PVC, Polyamides, Polyurethane, Polyethylene, Polypropylene, PET, Resins (Phenol Formaldehyde), PM MA, PAN, Rubber, Conducting and Biodegradable polymers Pyroceramics, Toughened glass, Strengthening of glass, Refractories, Nano Composites Protective Coatings Fe, Al, Cu, Pb & Zn alloys, Organometallics & their applications.

UNIT -IV FUELS & COMBUSTION

(8 L)

Classification of Fuels, calorific value of fuel, gross & net calorific value, determination of calorific value using Bomb calorimeter, Coal, Biomass and Biogas, Bio Fuel, Esterification & Transesterification, Introduction of Lubricants Mechanism of Lubrication, Classification of Lubricant, Bio Lubricant, Flash and Fire Point, Pour Point, Cloud Point, Aniline point, Viscosity index.

UNIT-V ANALYTICAL METHODS AND APPLICATIONS

(7 L)

Titrimetric analysis with reference to acid-base, redox, precipitation and complex metric titration. Elementary ideas and simple applications of UV, visible, mass and NMR spectral techniques AIM R spectral techniques.

REFERENCES :

Engineering Chemistry — Wiley India

Engineering chemistry by Sivasankar, TM H, New Delhi.

Organic Chemistry by Morrison & Boyd, Pearson Publication.

Organic Chemistry by Loudon, Oxford University Press.

C ParameswaraMurthy, C V Agrawal and etal., Engineering Chemistry, BS Publication, Hyderabad

UNIT-1

D.C. Network Theory : (5L)

Circuit theory concepts-Mesh and node analysis. Network Theorems- Superposition theorem. Thevenin's theorem, Norton's theorem, Maximum, Power Transfer theorem, Star Delta transformation.

Steady State Analysis of A.C. Circuits : (6L)

Sinusoidal and phasor representation of voltage and current: single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel and power factor, series parallel resonance-band width and quality factor : magnetic circuit.

UNIT-2 (6L)

Three Phase A.C. Circuits : 4Star-Delta connections, line and phase voltage/current relations,three phase power and its measurement.

3. Measuring Instruments:4Construction and principle of operation of voltage and current measuring instruments; introduction to power and energy meters.

UNIT-3 (8L)

Transformer : Principle of operation, types of construction, phasor diagram, equivalent circuit,efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests. Rotating Machine

Unit-4 (8L)

D.C. Machines: Principle of electromechanical energy conversion, types of d.c. machines,E.M.F. equation, Magnetization and load characteristics, losses and efficiency, Starter and speed control of d.c. motors, their applications.

Synchronous Machines: Principle of Operation of Alternator and synchronous motor.

UNIT-5 (7L)

Three Phase Induction Motor

Principle of operation, types and methods of starting, slip-torque characteristics applications. Single phase Motors : Principle of operation and methods of starting of induction motor, Stepper motor and universal motors.

References :

1. Dr. R. K. Singh and Dr. P.S. Subramanyam, Basic Electrical Engineering, BS Publication, Hyderabad.
2. Gaikwad, Basic Electrical Engineering, Wiley India
3. A.e. Fitzgerald, D.E., Higginbotham and A Grabel, -Basic Electrical Engineering - McGraw Hill.
4. H. Cotton, -Advanced Electrical Technologyll Wheeler Publishing.

MECHANICAL ENGINEERING
ME 101/201 (Autumn / Spring)

LTP
3 1 0

UNIT-1

Fundamental Concepts and Definitions

8L

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

UNIT-2

8L

Zeroth law:

Zeroth law, Different temperature scales and temperature measurement First law: 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-3

8L

Properties of steam:

Properties of steam, Phase transformation process and its graphical representation on P-V, T-V & T-s diagram, Mollier diagram and 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-4

8L

Force system and Analysis

Basic concept: Review of laws of motion, transfer of force to parallel position, resultant of planer force system, Free Body Diagrams Equilibrium. Friction: introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry friction.

Structure Analysis

Beams: Introduction, Shear force and bending moment, Shear force and bending moment diagram for statical indeterminate and indeterminate beams.

Trusses: Introduction, Simple Trusses, Determination of forces in simple truss members, Method of joints and Method of section.

UNIT-5

8L

Stress and Strain Analysis

Simple stress and strain: Introduction, Normal shear stresses Stress-strain diagrams for ductile and brittle materials, Elastic constants, One dimensional loading of members of varying cross section, Strain energy, Thermal stresses. Compound stress and strains: Introduction, State of plane stress, Principal stress and strain, Mohr's circle for stress and strain.

Pure Bending of Beams: Introduction, Simple bending theory, Stress in beams of different cross sections. Torsion: Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

Reference:

Agarwal, Basic Mechanical Engineering, Wiley India

Holman, J.P. : Thermodynamics, Mc Graw Hill book Co. NY.

Singh Onkar, Bhavikatti S.S., Chandra Suresh : Introduction to Mechanical Engineering:

Thermodynamics Mechanics and Strength of Materials, New Age International Publishers

Yadav R. : Thermodynamics and Heat Engines Vol I & II (SI Edition) Central Publishing House Allahabad.

FUNDAMENTALS OF COMPUTER & PROGRAMMING (TCS 101/201)

L T P

3 1 0

UNIT-I

8L

Introduction to Computer Systems; Data representation: Number systems, character representation codes, Binary, hex, octal codes and their inter conversions. Binary arithmetic, Floating point arithmetic, signed and unsigned numbers IEEE standards, CPU organization, ALU, registers, memory, the idea of program execution at micro level. Concept of computing, contemporary Operating Systems such as DOS, Windows, UNIX etc. (only brief user level description). Introduction to organization and architecture of mainframe, mini and micro systems.

UNIT-II

8L

Concept of flow chart and algorithm; Algorithms to programs: specification, top-down development and stepwise refinement, Introduction to the design and implementation of correct, efficient and maintainable programs, structured Programming, Use of high level programming language for the systematic development of programs, programmability and programming languages, Object codes, compilers. Introduction to the Editing tools such as vi or MS-VC editors.

UNIT-III

10L

C: Data types, Identifiers, Storage class, Constant, Operators, expression, Statements, console I/O statements, Selection statements: if-else, switch, Iteration Statements: for, while, do-while, Jump statements: return, go to, break, continue, comments. Function, Call by value, Call by reference, arguments to main(), return statements, recursion, function prototypes, preprocessor directives.

UNIT-IV

6L

Arrays:

Single dimensional arrays, two dimensional arrays, multidimensional arrays, variable length arrays. Strings, array of strings. Structures: array of structures, passing structure to function, structure pointers, structure within structures. Unions, bit fields, enumerations.

UNIT-V

8L

Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic allocation functions.

File VO : Streams and files, file system basics, fread, fwrite, fseek, random access I/O, fprintf(), fscanf(), standard streams.

References:

Gupta: Computer Concepts & C Programming, Co md ex Jones, C Programming with problem solving, Wiley India Let U s C : Y a s h w a n t K a n e t k a r [B P B]

Mastering C, K . R . V e n u g o p a l, S . R . P r a s a d [T M H]

Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, [India Edition]

UNIT-1

Semiconductor materials and properties

4L

Group-IV materials Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concepts of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities

UNIT-2

Junction diode and diode applications

5L

p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage) Diode Applications 4L rectifiers (half wave and full wave), calculation of transformer utilisation factor and diode ratings, filter (C — filter), calculation of ripple factor and load regulation clipping circuits, clamping circuits, voltage multipliers.

UNIT-3

4L

Breakdown diodes: breakdown mechanisms (zener and avalanche), breakdown characteristics, zener resistance, zener diode ratings, zener diode application as shunt regulator.

UNIT-4

Bipolar Junction Transistor

5L

Basic construction, transistor action, CB, CE and CC configurations, input/output Characteristics, concept of Biasing of transistors-fixed bias, emitter bias, potential divider bias Transistor Amplifier Graphical analysis of CE amplifier, concept of voltage gain, current gain, h-parameter model (low frequency), computation of A_i , A_v , R_i , R_{pf} single transistor CE and CC amplifier configurations.

Field Effect Transistor 6L **JFET:** Basic construction, transistor action, concept of pinch off, maximum drain

saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations Introduction to self and fixed biasing

MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics. Computation of A_v , R_i , R_o , of single FET amplifiers using all the three configurations Switching theory and logic design

4L

Number systems, conversions of bases, Boolean algebra, logic gates, concept of universal gate, concept of K- Map

Operational Amplifiers 4L Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders,

References:

1. R. K. Singh & Lal Kishor, Basic Electronics Engineering, B S Publication, Hyderabad.
2. Gaikwad, Basic Electronics, Wiley India
3. A Mottershead, 'Electronic devices and circuits'. PHI, 2000.
4. Morris Mano, 'Digital Computer Design', PHI, 2003.

BASIC TECHNICAL COMMUNICATION (THM 101)

L T P

3 00

RELEVANCE OF TECHNICAL COMMUNICATION FOR TECHNOCRATS-

English Communication is an integral part of today's life. The advent of new technologies *has* lead to the rapid development of a global village. A budding technocrat must be equipped with English language proficiency so that he/ she can make a mark in this global vi I I age. Engineering students come from different backgrounds with different mother tongues. It is **imperative for them to overcome their native accentual patterns and gain proficiency inspeaking standard English**. They also need to acquire optimum writing skills Hence proper training in Englishspeaking and writing is necessary. This goes hand in hand with the development of reading and listening skills. The course of Basic Technical Communication will help in the development and improvement of the communication skills and linguistic competence of engineering students.

OBJECTIVES:-

1. To help students perform better in all academic subjects through greater command over theEnglish language.
2. To promote efficiency in English language with the development of the four skills of communication i.e., LSRW (Listening, Sp:icing, Reading and Writing).
3. To prepare students face the challenges of their professional lives in an increasingly global ised world.

UNIT – I:COMMUNICATION

- 1) Communication – Definition. Process of communication,
- 2) Types of communication—Verbal and Non-Verbal communication; Formal and Informal communication (grapevine) and their significance.
- 3) Barriers to Communication—Semantic barriers, Physical barriers, Psychological barriers, Interpersonal barriers and Organizational barriers. Language as atool of communication.
- 4) Importance of communication with reference to students, professionals business etc.
- 5) Technical communication: Definition, Oral and Written technical communication. Difference between general writing and technical writing.
- 6) Computer-aided Technical Communication.
- 7) Style in Technical Communication. Features of technical writing.
- 8) Importance of Technical Communication

UNIT-2:READING SKILLS

- 1) Importance of Reading Skills Types of Reading Skills Methods of Improving Reading Skills Objectives of Improving Reading Skills
- 2) Vocabulary Building: Antonyms, Synonyms, Homophones Word formation (Prefixes and Suffixes). One Word substitution,
- 3) Jargon/Technical Terminology– Use of Jargon and examples of Jargon.
- 4) Paragraph: Definition. Requirements of a paragraph -- Understanding, Unity, Coherence and Emphasis in a paragraph. Identifying the Topic Sentence. Development of a Paragraph using Deductive order, Inductive order, Chronological Order (Time Order), Spatial Order (Space Order), Expository Order, Question and Answer Order, Comparison and Contrast Order. Devices used to impart Coherence and Emphasis in a Paragraph. Analysis of a given Paragraph in terms of Unity, Coherence and Emphasis.
- 5) Developing Reading Skills and Reading Comprehension through the study of thematic and value based critical reading of the following essays –

1. Of Discourse by Francis Bacon
2. Unity of Minds by Dr. A.P.J. Abdul Kalam

UNIT-3:- WRITING SKILLS.

- 1) Importance of Writing Skills, Types of Writing Skills, Methods for Improving Writing Skills, Objectives of Improving Writing Skills
- 2) Functional Grammar- Parts of Speech.
- 3) Common Grammatical Errors: Errors of Syntax, Concord etc.
- 4) Sentence and Paragraph construction. Writing Expository, Argumentative, Deductive etc. Paragraphs.
- 5) Precis Writing
- 6) Letter writing: Formal and Informal Letters
- 7) Developing Writing Skills through the study of thematic and value based critical reading of the following short stories-
 1. After Twenty Years by O. Henry
 2. The Open Window by Saki (H.H. Munro)

UNIT 4:- LISTENING SKILLS

- 1) Importance of Listening Skills, Process of listening, listening and hearing, Active and Passive Listening. Types of Listening: Academic listening, Appreciative listening, Attentive Listening, Critical Listening, and Discriminative listening etc.
- 2) Methods for Improving Listening Skills Objectives of Improving Listening Skills
- 3) Barriers to listening: Semantic barriers Physical barriers, and Psychological barriers
- 4) Listening Comprehension: Identifying general content, Identifying specific information.
- 5) Listening for Noticing and drawing inferences
- 6) Developing listening skills and listening comprehension through the study of thematic and value based critical reading of the following one-act play.
 1. The Refund by Fritz Kari nthy
- 7) Practice of Listening Skills through Language Laboratory
 - Listening to a recording of a telephone conversation for identifying specific information as well as details.
 - Listening to a recording of a rdllway/ airport announcement for selective listening and identifying specific information.
 - Listening to a recording of a radio / television news bulletin for identifying specific as well as over-all information
 - Listening to a recording of the description of a place, event or incident for note-taking, identifying details, descriptions and overall idea
 - Listening to a recording of a lecture/ talk on for note tdcin g and identifying facts and drawing conclusions
 - Listening to a recording of a televi sion panel discussion on any topic for identifying facts, analyzing those draNi ng inferences and explaining the conclusion of the discussion in a logical manner.
 - Listening to passages that are read out for practicing note tdcin g and identifying general and deta I ed content. Listening to dialogues that are read out for identifying specific, general and detailed content.

UNIT-5:- SPEAKING SKILLS.

- 1) Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills, Objectives of Improving Speaking Skills

- 2) Organs of Speech, Mechanism of Speech.
- 3) Phonetics: Classification of English Sounds, Vowel (short vowels and long vowels), Consonants, Diphthongs, Phonemes, Allophones, Phonetic transcription.
- 4) Syllable: Definition, Types of Syllable. Monosyllabic, Polysyllabic words etc.
- 5) Stress, Rhythm, Intonation: Rising Tone, Falling Tone and Rising-Falling Tone.
- 6) Everyday Conversation Tips and Characteristics of a Good Conversation., Common Manners and Etiquette.
- 7) Debate, Making a speech, Role play,
- 8) Extempore, JAM Session (just a minute session).
- 9) Practice of Speaking Skills through Language Laboratory

1. Practicing the following modules through self-learning software:

- a. Grammar with special emphasis on Tenses
- b. Pronunciation: of consonants, vowels, syllables and individual words
- c. Word Stress: based on accentual patterns
- d. Rhythm in speech based on content words and strong words
- e. Intonation: rising, falling and rising-falling tone
- f. Pause groups
- g. Speech making / public speaking

2. Introducing self and others keeping in mind kinesics.

3. Common conversation practice (making small talk etc.).

4. Asking for permission.

5. Making requests

6. Describing events/ people/ places

7. Extempore.

8. JAM Session (Just a Minute Session).

9. Role play

10. Holding informal discussions

11. Logical presentation of one's views on a given topic.

12. Delivering a speech using Stress, Rhythm and Intonation.

Note: The two class tests for theory will be of 10 marks each and two class tests of Basic Technical Communication will be of 10 marks each so that the total marks for class test will be of 40 marks and 10 marks will be for tutorial/attendance/home assignments. The subject faculty is requested to send the class test marks indicating both for theory and lab separately.

(b) Kindly make following changes in the structure of B.Tech. 1st year syllabus. In the subject of THM 101 Basic Technical Communication indicate

SUGGESTED REFERENCES BOOKS:

Kavita Tyagi & Palma Misra Basic Technical Communication, PHI, New Delhi

Norman Lewis: Word Power Made Easy, W.R Goyal Pub. & Distributors.

Ruth Ford A: Basic Communication Skills; Person Education, N. Delhi

Joans Daniel: English Pronouncing Dictionary, Cambridge

John Seely: The Oxford Guide to Writing and Speaking. OUP, Delhi

Mohammad Aslam: Introduction of English Phonetics and Phonology Cambridge

Y Kameswari, Successful Career Soft Skills and Business English, BS Publications, Hyderabad

1. Introduction

Graphics as a tool to communicate ideas Lettering and' dimensioning, Construction of geometrical figures like pentagon and hexagon.

2. Orthographic Projection

Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections. Projection of points. Pictorial view. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Sol ids lying on a face or generator on a pl me. Sectioni ng of solids lying in various positions True shape of the section. Development of lateral surfaces, sheet metal drawing.

3. Isometric Projection Principles of isometric projection, Isometric projection using box and offset methods

1. Bhatt. N.D.: Elementary Engineering Drawing, Charohtar Publishing.
2. D A Hindoliya, Text book of Egg. Graphics, BS Publication, Hyderabad

WORKSHOP PRACTICE (PWS 101/201)

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0 0 2

1. Carpentry Shop:

1. Study of tools and operation and carpentry joints
2. Simple exercise using jack plane.
3. To prepare half- L corner joint, mortise and tenon joints
4. Simple exercise on wood working lathe.

2. Fitting Bench Working Shop :

1. Study of tools and operations
2. Simple exercises involving fitting work.
3. Making perfect male-female joint
4. Simple exercise involving drilling/tapping/dieing.

3. Black Smithy Shop :

1. Study of tools and operations
2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop :

1. Study of tools and operations .
2. Simple butt joint.
3. Lap joint.
4. oxy wetylene welding.

5. Sheet metal shop :

1. Study of tools and operations
2. Making funnel complete with soldering.
3. Fabrication of tool box, tray, electrical panel box etc

6. Machine Shop :

7. 1. Study of tools and operations

8. 2. Plane turning.

9. 3. Step turning.

10.4. Taper turning

11.5. Threading.

12.6. Single point cutting tool grinding.

References:

- 1.** Hajra, Bose, Roy: Workshop Technology Vol 1 & 2, Media Promoters
- 2.** Raghuvanshi B.S.: Workshop Technology, Vol 1 & 2, Dhanpatrai

C Programming Lab (PCS-101/201)

List of Experiments

- 1.** Practice of all internal and External DOS Commands
- 2.** Practice of all UNIX commands and write simple shell script.
- 3.** WAP to perform simple arithmetic operations using different data types.
- 4.** WAP to swap two numbers without using third variable.
- 5.** WAP to find out whether the given number is prime or not.
- 6.** WAP using conditional operator to determine whether a year is leap year or not.
- 7.** WAP to print the ASCII code and their equivalent characters.
- 8.** WAP to print corresponding days of a week using switch case.
- 9.** WAP to print factorial of a number using recursion.
- 10.** WAP to print Fibonacci series using function.
- 11.** WAP to print an array and find greatest element of the array. **12.** WAP to arrange elements of a given array in ascending order. **13.** WAP for Matrix multiplication and find the inverse of resultant matrix. **14.** WAP to print name, price & no. of pages of 3 books using structures.
- 15.** WAP to remove the trailing blanks in a string input by the user, and print the resulting string using pointer.

CHEMISTRY PRACTICALS (CPY 101/201)

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LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary & permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of iron content in the given ore by using external indicator.
6. Determination of Acid & Base no. in lubricating oil by potentiometric method.
7. Determination of Equivalent weight of Iron by the chemical displacement method. The equivalent weight of copper is 63.5.
(Note : The procedure to be followed in carrying the above experiment is given as annexure)
8. Determination of viscosity index of lubricating oil.
9. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as colour developing agent & the measurements are carried out at λ_{max} 480nm.

Note : The general procedure of estimation is given on pp653-8 of the textbook Of Quantitative Chemical Analysis by A.I.Vogel 6th Edition, Publisher : Pearson Education Ltd.2000

10. Determination of heat of neutralization of Hydrochloric acid & Sodium hydroxide
11. Determination of flash & fire point of lubricating oil
12. Determination of Carbon residue of lubricating oil.
13. Determination of Sulphated ash of motor oil.
14. Determination of saponification value of lubricating oil & vegetable oil.
15. Separation of metal ions by paper chromatography.

MATHEMATICS-II (TMA-201)

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Unit-1

Differential Equations

8

Ordinary differential equations of first order, Exact differential equations, Linear differential equations of first order, Linear differential equations of nth order with constant coefficients Complementary functions and particular integrals, Simultaneous linear differential equations Solutions of second order differential equations by changing the dependent and independent variables Method of variation of parameters.

Unit-2

Laplace Transform

10

Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Laplace transform of periodic function, Unit step function, Convolution theorem, Applications to solve simple linear and simultaneous linear differential equations.

Unit-3

Infinite Series

8

Introduction, Sequences Series: Convergence, Series of positive terms, Comparison tests Integral tests, Comparison of ratio's, D'Alembert ratio test, Raabe's test, Cauchy root test, Alternating series: Leibnitz rule, Power series Uniform convergence, Weierstrass's M-test, Properties of uniformly convergent series.

Unit-4

Fourier Series and Partial Differential Equations

8

Periodic functions Trigonometric series Fourier series of periodic function, Euler's formula, Functions having arbitrary period, Change of intervals, Even and odd functions, Half range sine and cosine series.

Introduction to partial differential equations, Linear partial differential equations with constant coefficients of second order and their classifications: parabolic, hyperbolic and elliptic with illustrative examples.

Unit-5

Applications of Partial Differential equations

8

Method of separation of variables for solving partial differential equations One dimensional wave equation, Laplace equation in two dimensions, Heat conduction equations of one dimension and two dimension.

References:

1. A Text book of Engineering Mathematics (Vol.2) by Peter V. O'Neil, Cengage Learning.
2. B. S. Grewal: Higher Engineering Mathematics, *Khanna Publications*.
3. C. Prasad, Advanced Mathematics for Engineers Prasad Mudralaya
4. E. Kreyszig: Advanced Engineering Mathematics, Wiley Eastern.
5. M.D. Raisinghania: Ordinary & Partial Differential Equations, S. Chand Publication

ADVANCED TECHNICAL COMMUNICATION

L T P
3 0 2

MAXIMUM MARKS-100

UNIT 1 : TECHNICAL COMMUNICATION

1. Introduction to technical communication, types of technical communication, history of the development of technical communication.
2. Difference between general and technical communication, importance of technical communication.
3. Characteristic features of technical communication. Elements of style in technical communication.
4. Process of preparing a technical document.
5. Elements, features and objectives of scientific articles, research papers, dissertation and thesis.

UNIT 2:-BUSI NESS COMMUNICATION

1. Importance and Features of Business Communication
2. Business Correspondence — Principles, Features, Types, Format and layout of Business letter.
3. Types of Business Correspondence — letters of Enquiry, Quotation, Order, Instructions, Sales, Credit, Complaint, Collection etc.
4. Some more types of Business Correspondence Notice, Agenda, Minutes, Memorandum.
5. Job Application letters -- Covering letter, Resume, Bio-data and C.V.

UNIT 3:- TECHNICAL PROPOSAL and TECHNICAL REPORT

1. Technical Proposal — Introduction, purpose, features, types, format, importance, process of preparation. Writing technical proposals.
2. Technical Report -- Features, Types, Style, Format, Relevance. Writing Technical Reports.

UNIT 4:-LITERATURE

1. Critical reading and thematic, value-based study of the Novella, 'Animal Farm' by George Orwell.
2. Critical review, study of theme, plot, symbolism, characterization, style of writing etc.

UNIT 5:- SOFT SKILLS

This unit should be covered in classroom teaching as well as judicious use of language lab, (There should be optimum use of software's related to accent, presentation skills etc.)

1. Kinesics, Para language, Proxemics.
2. Presentation skills - Features, Types, Structure, Aids and Importance.

3. Interpersonal communication skills — Role of Personality and its various attributes like EQ, attitude, motivation, stress management and accepting criticism in determining efficacy of interpersonal communication.
4. Corporate communication skills — Role of business etiquette, conducting meetings, managing conflict, negotiation, team spirit, decision-making, time management and problem solving skills.
5. Group Discussion skills - Features and Importance
6. Facing Interviews - Interview Tips.

❖ **Practice of Soft Skills using Language Laboratory**

1. Practicing the following modules through self-learning software:
 - a. Pronunciation: of consonants, vowels, syllables and individual words
 - b. Word Stress: based on accentual patterns
 - c. Rhythm in speech based on content words and strong words
 - d. Intonation: rising, falling and rising-falling tone
 - e. Pause groups Presentation skills
2. Participating in Mock Interviews
3. Participating in Group Discussions
4. Giving Presentations keeping in mind Kinesics, Para language, and Proxemics
5. Participating in Role Play for enhancing interpersonal and corporate communication skills

SUGGESTED REFERENCE BOOKS

- Kavita Tyagi & Padma Misra, Advance Tech. Communication, PHI, New Delhi
- | | |
|------------------|---|
| George Orwell | Animal Farm, Penguin Publishing Company, N. Delhi |
| Daniel Riordan | Technical Communication, Cengage Learning, N. Delhi |
| Raman & Sharma | Technical Communication, OUP, N. Delhi |
| Wallace, Masters | Personality Development, Cengage Learning, N. Delhi |
- Bhaskar Rao, Successful Career Soft Skills and Business English, BS Publications, Hyderabad
- Chakrawarthy: Soft Skills for Professionals, Wiley India

**Third Semester
Applied Geology-I (TPE-301)**

**L T P
2 0 0**

- Unit 1** **[8]**
Origin of Earth, Earth's structure: core, mantle and crust; geological time scale and Geological processes for rock formation.
- Unit 2** **[8]**
Minerals and Rocks: properties and identification of specimens in hand, and under microscope.
Rock Types: Igneous, Sedimentary and Metamorphic: Forms of Intrusive and Extrusive rock.
- Unit 3** **[6]**
Stratigraphy: Stratigraphy principle, sequence, litho-stratigraphy, biostratigraphy, bio-stratigraphy, Stratigraphy of India –basics.
- Unit 4** **[8]**
Paleontology - fossils, and there mode of preservation, fossils-micro, macro, palyno, index fossils, and significance in petroleum exploration.
- Unit 5** **[10]**
Structural Geology, Rock structure type, fault, topography, outcrops, Deformation of Rocks; Simple dipping beds, folds, faults, Joints, unconformity, there classification, recognition and signification in petroleum exploration. Igneous intrusion-dykes, sill and batholith.

Fluid Mechanics and Machinery (TPE-302)

L T P
31 0

Unit 1

[8]

Newtonian and non-Newtonian fluids, Incompressible and compressible flow, two phase flow, friction factor estimation, straight pipe bends, elbows, converging, diverging section.

Unit 2

[6]

Fluid pressure measurement, piezometers, manometers, flow of fluid in pipes and on flat surfaces.

Unit 3

[8]

One and two dimensional flow equations, Bernoulli's equation application, venturimeter, orifice meter equivalent, Slurry transport.

Unit 4

[10]

Pumps: types, reciprocating and rotary pump, construction details, performance characteristics, single & multistage operation, turbine pumps, multistage turbine pumps.

Unit 5

[8]

Compressors Types, rotary and centrifugal - single stage and multistage, construction details and performance characteristics.

Chemical Thermodynamics (TPE-303)

L T P
21 0

Unit 1

[6]

Compression/expansion of ideal and non-ideal gases, horse power calculations, single and multi-stage operation.

Unit 2

[10]

Thermodynamics of gases and liquid hydrocarbons, force, energy, work function, Mollier diagram, perfect and imperfect gases mixture, equation of state, law of corresponding states, Joule–Thompson effect, Arrhenius equation, activation energy, fugacity and fugacity coefficient, Lewis fugacity rules, third law of thermodynamics.

Unit 3

[8]

Solution Thermodynamics, vapour-liquid equilibria, partial molar properties, chemical potential, Raoult's law and Henry's law, ideal and non-ideal solutions, activity and activity coefficients.

Unit 4

[8]

Gibb's–Duhem equation, Gibb's absorption equation, phase rule, single and multi-component system, phase behavior, phase equilibria calculations, ternary and pseudo-ternary phase diagrams.

Unit 5

[8]

Fluid flow thermodynamics, multi-phase flow in vertical, inclined and horizontal conduits, pressure traverse and calculation, thermodynamics of multi-phase multi component system.

Heat Transfer Process (TPE-304)

L T P
31 0

Unit 1

[6]

Heat transfer mode, conduction, convection, radiation, effect of temperature on thermal conductivity of materials.

Unit 2

[6]

Heat flow through solid and fluid, steady and unsteady heat transfer, heat transfer coefficient, analogy between heat and electricity flow.

Unit 3

[8]

Heat transfer to fluid with and without phase change, evaporation and condensation.

Unit 4

[12]

Heat exchange equipment, types, construction details, operating characteristics, shell and tube, double pipe extended surface heat exchanger, heat exchange fouling remedial action.

Unit 5

[8]

Pipe still furnace, construction details, and operational characteristics.

Engineering Mathematics-III (TMA-315)

L T P
31 0

Unit 1

[8]

Functions of complex variables I: Analytic function, Cauchy-Riemann Equation, Harmonic Functions, Line Integral in complex plain, Cauchy Integral Theorem, Cauchy Integral Formula for derivatives of Analytical functions.

Unit 2

[6]

Functions of complex variables II: Power series, Taylor series, Laurent Series, Poles, zeros, singularities, residue Theorem, evaluation of Real Integrals of the type $\int_0^{2\pi} (\cos\theta, \sin\theta) d\theta$ and $\int_0^{2\pi} F(x) dx$.

Unit 3

[8]

Special Function: Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation, Legendre polynomial of first kind, Bessel function of first kind and their properties.

Unit 4

[8]

Numerical Technique 1: Zero's Transcendental and Polynomial equation using Bisection methods, Newton Raphson Method, rate of convergence of above methods, interpolation, finite differences and difference table, Newton forward and newton backward interpolation, Lagrange and Newton Divided difference formula for unequal intervals.

Unit 5

[8]

Numerical Technique II: Solution of system of linear equations, Gauss Seidal methods, Crout Methods, Numerical integrals, Trapezoidal Rule, Simpson 1/3 rule, Simpson 3/8 rule, solution of ordinary differential equations (I, II and simultaneous equations) by Picard and Forth order Ranga-Kutta Method.

Ground Surveying (TCE-317)

L T P
31 0

Unit 1

[10]

Objective, classification, principles, application, linear measurements, ranging and changing, obstacles and error correction principles, offsets and booking.

Unit 2

[6]

Angular measurement, prismatic compass, bearing, magnetic declination.

Unit 3

[8]

Theodolite, transit theodolite, adjustments, measurement of horizontal and vertical angles, errors, traversing, leveling, instruments, curvature and refraction, corrections, Reciprocal leveling, errors.

Unit 4

[8]

Plane table surveying, methods, transferring, two point and threepoint problem etc., contouring, interval, characteristic, methods of locating contour, interpolation.

Unit 5

[8]

Global positioning system(GPS), theory, principles and application and GIS: introduction and application in mapping.

Fluid Mechanics & Machinery Lab (PPE 351)

**L T P
002**

(Minimum 8 experiment of the following to be conducted)

1. To calibrate an orifice meter, venture meter and Bend meter and study variation of coefficient of discharge with Reynolds Number.
2. To study the transition from Laminar to Turbulent Flow and to determine the lower critical Reynolds number.
3. To study the variation of Friction Factor 'f' for Turbulent flow in commercial pipes.
4. To study boundary layer velocity profile over a flat plate and determine the boundary layer thickness.
5. Impact of Jet experiment.
6. Turbine experiment on Pelton wheel.
7. Turbine experiment on Kaplan turbine.
8. Experiment on centrifugal Pump.
9. Experiment on hydraulic Jack/Press.
10. Experiment on hydraulic Brake.

Heat Transfer Process Lab (PPE 352)

**L T P
002**

(Minimum 8 experiment of the following to be conducted)

1. Conduction –composite wall experiment.
2. Conduction- composite cylinder experiment.
3. Convection heat pipe experiment.
4. Any experiment-Such as on Steffen's Law on radiation determination of emissivity, etc.
5. Heat exchanger-Parallel flow experiment.
6. Heat exchanger-Counter flow experiment.
7. Experiment on measurement of critical thickness.
8. Conduction- Determination of Thermal conductivity of Fluid.
9. An experiment on solar collector on Radiation.

Ground Surveying Lab (PCE-355)

L T P
0 0 2

(Minimum 8 experiment of the following to be conducted)

1. Study of different types of topographical maps and to prepare conventional symbols chart.
2. To find out reduced level of given point using dumpy/Auto level.
3. To study parts of venire / Electronic theodolite and practice for taking angle measurements.
4. To measure vertical angle of given points by Electronic Theodolite.
5. To measure horizontal angle by method of reiteration.
6. To determine the elevation of chimney top by trigonometrically leveling by taking observation in single vertical plane.
7. To plot the co-ordinates at given scale on plane table and their field checking.
8. GPS demonstration and coordinate observations.
9. GIS demonstration and study of its applications.

Value Addition Training-I (VAT-351)

L T P
002

The objective of this Value added training program is bridge the gap between academic and industry needs. The main focus of this program is to equip and train prospective students with specialized knowledge in the field of understanding English as a second language with reference to the cultural needs. It consists of methodological and pedagogical approaches to understand and learn English as not only a major language all over the world at present time but also the official language in many parts of the world. The learning outcome of this training is to remove all inhibitions and speak fluently in English.

Training Methodology:

- (1) Lecture-cum-discussion
- (2) Games
- (3) Group Discussion
- (4) Case Studies
- (5) Audio & Video sessions
- (6) Questionnaire Method
- (7) Reading comprehension

Communication Practice: This module aims

- ❖ To expose students to a variety of self-instructional learner friendly modes of language learning.
- ❖ To enable them to learn better pronunciation through stress on word accent, intonation and rhythm.
- ❖ To develop good linguistic ability- through accuracy in grammar, pronunciation and vocabulary.

1. **Friendly Communication:** Doing things with words- to ask for information, help, permission. To instruct, command, request, accept, refuse, prohibit, persuade.
2. **Grammar & Vocabulary:** The focus will be on appropriate usage of language. Elimination of common errors, editing passages, word power A-Z (easy and quick techniques), vocabulary building exercises.
3. **Speaking English:** Situational dialogues/ role plays (Organization Communication), Oral presentations (prepared and extempore), Just a minute sessions(JAM), Debates.
4. **Reading Skills:** Students will be given practice in reading and comprehension on topics of general interest as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment.
5. **Writing Skills:** Short paragraphs on current, general and technical topics, creative writing (Idea generation), Business letters, e-mail messages, project writing, writing resumes and cover letter.

**Fourth Semester
Applied Geology-II (TPE-401)**

**L T P
3 0 0**

- Unit 1** [8]
Sedimentary process and their products, morphology and textural properties, sedimentary structures, different types of sedimentary rocks. Important sedimentary groups: clastic, carbonates.
- Unit 2** [6]
Sedimentary environment reconstruction; concept of sequence stratigraphy.
- Unit 3** [6]
Sedimentology and petroleum exploration, basin modeling, Sedimentary Basins of India
- Unit 4** [10]
Origin of Petroleum source rock and maturation process, migration of petroleum, mechanism, path, barriers, reservoir rocks and cap rocks.
- Unit 5** [10]
Petroleum Entrapment – process and types, petroleum reservoirs, geology of prospective basins in India on shore & off shore.

Elements of Reservoir Engineering (TPE-402)

L T P
3 1 0

Unit 1 **[8]**

Reservoir rock properties: porosity, permeability, evaluation, parallel and series bed system, fluid saturation, effective and relative permeability, wettability, capillary pressure characteristics, evaluations and significance.

Unit 2 **[10]**

Reservoir fluid system: volumetric and phase behavior of multi-component oil / gas systems, formation volume factor for oil and gas, viscosity, reservoir fluid sampling, PVT properties, measurement, estimation and application.

Unit 3 **[8]**

Fluid flow through porous media: Darcy's law, single and multi- phase system, linear, radial and spherical flow, steady and un-steady state flow, flow through fracture, GOR and WOR equations.

Unit 4 **[6]**

Reservoir pressure determination: pressure measurement techniques, bottom hole pressure gauges, determination of reservoir pressure, significance.

Unit 5 **[8]**

Reservoir drives: depletion, water drive, gas cap drive, combination drive, recovery factor, reserve estimation: resource and reserve, SPE classification of reserve, volumetric reserve estimation.

Petroleum Exploration Methods (TPE-403)

L T P
3 1 0

A) Geological and Geochemical methods:

Unit 1 [8]

Surface indication of oil /gas accumulation, accumulation parameters: regional and local structure, time of generation vis-a-vis accumulation.

Unit 2 [7]

Geochemical methods of prospecting: soil chemical survey, source rock characterization, hydro-geochemistry as exploration tool, plate tectonics and hydrocarbon accumulation.

Unit 3 [6]

Geological exploration process, sequence of operation, field development, prognostication of reserves.

B) Geophysical Exploration methods and their significance

Unit 1 [5]

Magnetic survey—survey instrument, geomagnetic anomalies, field methods, data correction and reduction, anomalies interpretation, response for different type of geological structure, remote sensing

Unit 2 [5]

Gravity method, Unit measuring instruments, gravity anomaly, data correction and reduction, free air and bouguer anomalies, anomaly interpretation, application.

Unit 3 [10]

Seismic methods, type, methodology of refraction profiling, field survey arrangements, recording instruments, data correction, special shooting methods, fan and broadside, data interpretation and application in identification of structures, reflection seismograph and seismogram relative advantage over refractive survey, common depth point profiling and stacks time correction, well seismic methods, vertical seismic profiling, interpretation, 3D data acquisition and interpretation, application of reflection survey.

Petroleum Production Operation-I (TPE-404)

L T P
3 1 0

- Unit 1** [8]
Production well equipment: tubing heads, Christmas tree, valves and chokes, flow tubing and flow line performance.
- Unit 2** [8]
Self flow well characteristics, productivity and GOR, fluid production handling system, group gathering station, layout separation system.
- Unit 3** [10]
Artificial lift methods of production, continuous gas – lift and intermittent gas lift, principle, system and performance.
- Unit 4** [8]
Sucker rod pumping methods, system characteristics, plunger and rod stress conditions.
- Unit 5** [6]
Dynamometer system and application, down hole pumping system.

Numerical Methods in Engineering (TPE-405)

L T P
3 1 0

Unit 1 [8]

Introduction to numerical computing, approximations and errors in numerical computations. Truncation and round off errors, propagation of errors, root finding: bisection method, regulafalsi method, iteration method, Newton Raphson method, systems of nonlinear equations, Rate of convergence of above methods.

Unit 2 [8]

Matrix algebra, solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, Crout's method, Jacobi method, Gauss Seidel method, convergence of iterative methods.

Unit 3 [10]

Interpolation and extrapolation: Finite differences, Difference table, Newton's forward and backward interpolation formula, lagrange interpolation formula. Divide differences and Newton's divide differences formula. Numerical differentiation, numerical integration: Trapezoidal and Simpson's rules, Weddle's formula, Gaussian Quadrature.

Unit 4 [8]

Numerical solution of O.D.E: Picard's method, Taylor series method, Euler's method, Modified Euler's method, Forth order Runge Kutta methods. Multistep methods: Milne's method.

Unit 5 [8]

Numerical solution of P.D.E: Introduction, classification of second order equations, Finite difference approximation to derivatives, Elliptic equations, solution of Laplace equations, Solution of Poisson's equation, parabolic equations, solution of heat equations.

Oil and Gas Well Drilling Technology and Well Completion (TPE-406)

L T P
31 0

Unit 1 [8]
Site selection, rig selection, drilling, choice of drilling method, rotary drilling rig components, rock bit types and operational characteristics, drill string components, drill pipes, drill collar, Kelly etc.

Unit 2 [8]
Load estimation and choice of materials, joint types, casing types and scheme.
Stress condition in casing string, design factors, casing head system, casing seat selection.

Unit 3 [8]
Oil-well cement and casing cementation, cement slurry design for efficient mud displacement, cementing quality evaluation, height of cement, cement bonding with casing and formation.

Unit 4 [10]
Use of logging methods for quality assessment, cement bond log, formation isolation testing, formation drill ability, factor effecting load on bit, rotational rpm, drilling fluid characteristics.

Unit 5 [6]
Well orientation survey, well deflection, direction determination and presentation, open-hole, perforated and slotted linear completion.

Petroleum Engineering Lab-I (PPE-451)

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(Minimum 8 experiments from the following to be conducted)

1. Determination of porosity of a specimen.
2. Determination of permeability of a specimen.
3. Determination of fluid saturation of specimen (Dean Stark).
4. Determination of electrical resistivity of a specimen.
5. Determination of rock capillary characteristics by drainage method
6. Determination of specific gravity and viscosity of drilling mud
7. Effect of chemicals on setting characteristics of cement slurry
8. Determination of strength (tensile and compressive) of cement block
9. Identification of presence of oil in the rock cuttings by UV method.
10. Interpretation of well logs for lithology, thickness, porous and non-porous zones and hydrocarbon bearing zones etc.

Numerical Methods Lab (PMA-452)

...L T P

...0 0 2

(Minimum 8 experiments from the following to be conducted)

1. To deduce error involved in polynomial equation.
2. To find out the root of the algebraic and transcendental equations using Newton Raphson method.
3. To implement Newton's forward and backward interpolation formula.
4. To implement Gauss elimination & Crout's method.
5. To implement Newton's Divided Difference and Lagrange's Interpolation formula.
6. To implement Numerical Differentiation.
7. To implement Numerical integration using Trapezoidal, Simpson 1/3 & Simpson 3/8 rule.
8. To implement fourth order Runge kutta method.
9. To implement numerical solution of Partial differential equation.
10. To implement solution of Laplace equation.

Applied Geology Lab (PPE-453)

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0 0 2

(Minimum 8 experiments from the following to be conducted)

1. Identification of colour, luster, forms, cleavage, fracture and determination of hardness of minerals.
2. Identification of common rock forming minerals in hand specimen and under microscope.
3. Identification of common rocks in hand specimens and under microscope.
4. Identification of different types of sedimentary rocks and common sedimentary structures.
5. Exercises on dip and strike of dipping beds.
6. Map based exercises on dipping beds, fold, faults and unconformities.
7. Sieve analysis of sand samples.
8. Grain size analysis – Histogram, frequency curve, cumulative frequency curve and their interpretation.
9. Determination of textural properties based on grain size analysis of sands samples.
10. Preparation of charts of Geological Time Scale; Moh Scale of hardness; various types of petroleum traps.

The objective of this Value added training program is bridge the gap between academic and industry needs. The main focus of this program is to equip and train prospective students with specialized knowledge in the field of understanding English as a second language with reference to the cultural needs. It consists of methodological and pedagogical approaches to understand and learn English as not only a major language all over the world at present time but also the official language in many parts of the world. The learning outcome of this training is to remove all inhibitions and speak fluently in English.

Training Methodology:

- (1) Lecture-cum-discussion
- (2) Games
- (3) Group Discussion
- (4) Case Studies
- (5) Audio & Video sessions
- (6) Questionnaire Method
- (7) Reading comprehension

Life Skills: This module aims to bring about personality development with regards to the different behavioral dimensions that have far reaching significance. The objective of this unit is to make students gain conviction and confidence, acquire better communication skills, adopt and understand soft skills techniques and its relevance in an individual's growth.

Presentation Skills: Handling stage fear and how to get rid of it, developing skills and confidence for an effective presentation and role of body language.

Leadership Skills: Introduction to leadership, leadership power, leadership styles

Interpersonal Relations: Introduction to interpersonal relations, analysis of different ego styles and analysis of life position.

Group Dynamics and Team Building: Importance of groups in organizations, interactions in a group, group decision taking, team building, interaction with the team and how to build a good team?

Business Etiquettes: Meeting etiquettes, E-mail etiquettes, behavior at work and getting along with others-Boss, colleagues and juniors.

Time Management: Time as a resource, identify important time management wasters, individual time management styles and techniques for better time management

Stress Management: Types of stress, how to handle different kinds of stress.

Motivation: Relevance and types of motivation, self motivation and motivating others.

Fifth Semester
Petroleum Production Operation-II (TPE-501)

L T P
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- Unit 1** [6]
Extraneous gas and water entry into well bore, source identification and control measures.
- Unit 2** [10]
Sand production and control, sand control techniques, produce sand analysis, gravel size selection, gravel packing fluid and gravel packing techniques.
- Unit 3** [10]
Well work-over problems, rig selection, rig-less work over, coiled tubing system, work overfluid design, planning and economics.
- Unit 4** [8]
Oil and gas separation system and process, optimization.
- Unit 5** [6]
Crude oil Storage, underground gas storage, effluent treatment and disposal.

Applied Petroleum Reservoir Engineering (TPE-502)

L T P
3 1 0

Unit 1

[6]

Gas, gas condensate and oil reserves, identification from fluid composition, production characteristics, reservoir drive mechanics.

Unit 2

[8]

Material balance equation: generalized and specific form for different drive systems, drive type identification, rock and fluid compressibility factor, recovery factor estimation.

Unit 3

[6]

Performance prediction, water influx estimation, drive-index, reservoir pressure maintenance, choice and system.

Unit 4

[10]

Immiscible displacement process, fractional flow and fractional displacement process in linear reservoir, Buckley and Leverett treatment, reservoir water flood performance.

Unit 5

[10]

Oil and gas field development, injection-production wells distribution pattern and characteristics, optimum well spacing from techno economics analysis of field performance, well and field production rate estimation, investment and operation cost, profitability estimation.

Unit Operations (TPE-503)

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3 1 0

Unit 1 [8]

Momentum, heat and mass balance in multi-component system, heat transfer process: Modes of heat transfer, heat flow through solid and fluid steady and unsteady state heat transfer.

Unit 2 [6]

Mass transfer and application, phase equilibrium, diffusion and inter-phase mass transfer.

Unit 3 [8]

Distillation: batch and continuous distillation, differential distillation, flash distillation, vacuum, molecular and steam distillation, principles of azeotropic and extractive distillation, introduction to multi component distillation system.

Unit 4 [8]

Extraction: liquid-liquid extraction, solid-liquid extraction, equipment used for single stage and multi stage continuous operation, analytical and graphical solution of single and multi stage operation, supercritical fluid extraction.

Unit 5 [8]

Absorption, drying, crystallization, humidification, stage and continuous contact mass transfer units, plate column, packed bed and fluidized bed.

Formation Evaluation (TPE-504)

L T P
3 0 0

Unit 1 **[6]**

Direct methods, core evaluation, mud and cutting analysis, significance.

Unit 2 **[8]**

Indirect methods, SP logs, principles and applications, resistivity logs, principles, electrodes systems, normal, lateral, latero logs, non-electrode system, inductionlog, principles and application.

Unit 3 **[8]**

Resistivity departure curves, origin and application, acoustic logs, ultrasonic wave velocity propagationthrough formation and relevant factors, wave amplitude and relevant factors, CBL.

Unit 4 **[8]**

Radioactivity logs, natural gamma-ray and neutron-log, principles, system and application. Special logging methods, casing inspection tools, formation micro scanner, NMR log, logging high angle wells.

Unit 5 **[10]**

Interpretation and analysis, formation types, thickness and sequence construction, fluid saturation determination, standard interpretation methods, cross-plotting methods, neutron-density, sonic density, clean and shaly sand interpretation.

Drilling Fluids and Cementation (TPE-505)

L T P
3 1 0

- Unit 1** [8]
Types of drilling fluids, water base and oil base, components of drilling fluid systems, bentonite types and hydration characteristics, properties, specific gravity, viscosity.
- Unit 2** [6]
Fluid-loss characteristics, filtrate resistivity, caking characteristics.
- Unit 3** [8]
Oil-base drilling fluid system, saline mud system, Additives used to control drilling fluid systems.
- Unit 4** [10]
Oil-well cements, compositions, cement slurry components, setting and rheological behavior of cement slurry, strength characteristics of set cement- mass additives used to modify cement slurry characteristics.
- Unit 5** [8]
Cement- slurry preparation and down hole displacement processes and system.

Non-Conventional Petroleum Resources (TPE-506)

L T P
2 0 0

Unit 1

[8]

Introduction and present status of coal bed methane. Formation and properties of coal bed methane. Thermodynamics of coal bed methane. Drilling, completion and logging of coal bed methane wells.

Unit 2

[8]

Hydro-fracturing of coal bed methane seam, production, installation and surface facilities, well operation and production equipment, treating and disposing produced water, testing of coal bed methane wells.

Unit 3

[8]

Introduction and present status of gas hydrates, formation and properties of gas hydrates. Thermodynamics of gas hydrates. Phase behavior of gas hydrates. Kinetics of gas hydrates. Drilling and completion of gas hydrates wells. Prevention and control of gas hydrates.

Unit 4

[6]

Gas hydrates accumulation in porous media. Gas extraction from gas hydrates. Uses and applications of gas hydrates.

Introduction and present status of shale gas. Formation and properties of shale gas. Drilling and completion of shale gas. Uses and application of shale gas, Prevention and control of shale gas. Environmental issues in shale gas exploration. Future prospects of shale gas.

Petroleum Engineering Lab-II (PPE-551)

L T P
0 0 2

(Minimum 8 experiments from the following to be conducted)

1. Study of fluid flow characteristics in a multiphase system (effective permeability vs saturation)
2. Study of immiscible displacement characteristics for oil/water and oil/gas systems.
3. Determination of displacement characteristics of rocks under polymer/ surfactant flooding.
4. Determination of Formation Volume Factor (B_o), Viscosity (μ_o) and gas – oil ratio of crude oil under a given pressure – volume- temperature condition.
5. Pressure – volume- temperature based characteristics of crude oil.
6. Determination of gas flow rate by Orifice meter.
7. Continuous and intermittent gas lifts by Demonstration Model.
8. Regulation of flow through Diaphragm Valve.
9. Studies related to Bottom Hole characteristics and operational mechanisms.
10. Study on Wax Controlling Production System.

Unit Operations Lab (PPE-552)

L T P
0 0 2

(Minimum 8 experiments from the following to be conducted)

1. To study about different types of heat exchangers.
2. To determine the liquid diffusion coefficient of benzene solution in distilled/de-ionized water.
3. To study and perform liquid-liquid extraction experiment.
4. To study and perform liquid-solid extraction experiment.
5. To study and perform the distillation experiment for batch distillation.
6. To study and perform the distillation experiment for continuous distillation.
7. To study and perform the adsorption experiment.
8. To study and perform the drying experiment.
9. To study and perform the adsorption experiment.

Objectives for this module:

- ❖ To develop inter personal skills and be an effective goal oriented team player.
- ❖ To develop professionals with idealistic, practical and moral values.
- ❖ To develop communication and problem solving skills.
- ❖ To re-engineer attitude and understand its influence on behavior.

Unit 1

Methodology Suggested

- (1) Lecture-cum-discussion
- (2) Games
- (3) Group Discussion
- (4) Case Studies
- (5) Audio & Video sessions

1. **Decision making and Independence:** Believe in yourself
Self analysis: Who am I, Attributes, Importance of Self Confidence, Self Esteem.
Importance and necessity of Decision Making
Process and practical way of Decision Making
Weighing Positives & Negatives.
Self analysis: Who am I, Attributes, Importance of Self Confidence, Self Esteem.
SWOT analysis
2. **GOAL SETTING** Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.
 - a. SMART Goal Setting
 - b. PEST analysis
3. **Thoughtprocess building:**
CREATIVITY: Out of box thinking, Lateral Thinking.
ATTITUDE: Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.
MOTIVATION: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.
Time Management Value of time, Diagnosing Time Management, Weekly Planner
To do list, Prioritizing work.
4. **Oral/Spoken English:** Exclusive to Indian English: Indianism
 - a. Pronunciation
 - b. Vocabulary Building Exercises
 - c. Sentence Structure
 - d. Voice modulation
5. **Presentation Skills.:** Includes Technical Topic Presentation
Defining purpose, analysis of audience and locate, organizing contents. Preparing an outline of the presentation. Visual aids, nuances of delivery, Body language
6. **Assessment:** A practical and activity oriented based on class room interaction, activities etc.

Unit 2

1. Objectives of Discussions and conversations:

Handling stage fright: - Public speaking and pressure handling.

Interpersonal Skills:

Understanding the relationship between Leadership Networking & Team work.

Assessing Interpersonal Skills

Situation description of Interpersonal Skill.

Conflict Resolution: Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

2. Expressions of courtesy: Understand the importance of Greetings and Expression of courtesy at work or in a social gathering.

3. Writing Skills: Tips for technical writing.

a. Letters (Formal and semi-formal)

b. Applying for a job (cover letter and resume writing)

c. Response to Email

d. Report writing

e. Review writing

4. Etiquettes.

5. Evaluation/Assessment: Practical and activity oriented based on class room interaction, activities etc.

Industrial Tour (PPE-553)

L T P
0 0 0

Assessment of the students will be done on the basis of report submitted by the student and thereafter on the basis of the viva-vocetaken by the faculties to check the knowledge gained by the students during the tour.

Sixth Semester
Offshore Drilling and Production Practices (TPE-601)

L T P
3 1 0

Unit 1 **[8]**

Physical Environment

Overview of physical ocean environment, geotechnical aspect–sea floor, marine soil composition and properties of sea water, seawater corrosion, offshore rigs, floating drilling vessels. Fixed offshore structures, wind, wave, current and other forces acting on offshore structures.

Unit-2 **[6]**

Field Operations

Station keeping, conventional mooring system, spread mooring system, design considerations, operations, equipment and functions, Dynamic positioning system, components, working.

Floater well control, shut in procedures, well kill operations, subsea well head, BOP Stack.

Unit-3 **[10]**

Deepwater Drilling

Deepwater well construction problems and solutions, deepwater cementation, high temp-high pressure wells, casing and mud policy. Drilling logs, gas hydrate problems. Deepwater drilling operations, Riser system, components, riser tensioners, heave compensator, emergency disconnect and hang off, wellbore stability and rock mechanics, mud window for vertical, horizontal deep water drilling. ROV

Unit-4 **[10]**

Offshore structures

Fixed steel structures, Concrete Gravity Base Structures, TLPs, Semi -submersible and Floating Production systems, SPM, SPAR Application. Depths and design limitations, Installation of offshore platforms, Typical Platform Layout, Process flow diagram, Static and Rotary Equipment. Safety systems.

Unit-5 **[6]**

Development and Production Operations

Risers for Production operations, deepwater completion, Subsea completion, planning, production monitoring and control system.

Petroleum Engineering Design-I (TPE-602)

L T P
3 1 0

Unit I:

[10]

Choice of well profile: drill string and casing design. Rig choice for load and installed power.

Unit II:

[8]

cement slurry design. Mud-circulation system, Bit choice.

Unit III:

[8]

Drilling policy specification for a given well location, depth, orientation.

Unit IV:

[6]

Profile and policy specification for deviated well.

Unit V:

[8]

Specification of casing head and well head system.

Natural Gas Engineering (TPE-603)

L T P
3 1 0

Unit 1 [8]

Introduction: Composition of Natural Gas, Utilization of Natural Gas, Natural Gas Industry, Natural Gas Reserves, Types of Natural Gas Resources, Future of the Natural Gas Industry.

Properties of Natural Gas: Physical properties of natural gas and hydrocarbon liquids associated with natural gas. Reservoir aspects of natural gas.

Unit-2 [6]

Gas Compression: Types of Compressors, Selection, Thermodynamics of Compressors, Compression calculations. Heat and Mass Transfer Principles and Applications in Natural Gas Engineering, Use of Mollier Diagrams.

Unit-3 [8]

Gas Flow Measurement: Process control and instrumentation in natural gas processing plants.

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, CNG, system, Conversion of gas to liquid.

Unit-4 [6]

Unconventional gas: Coal Bed Methane, Natural Gas Hydrate, Basin Centered Gas, Tight Gas Sands, Shale Gas. Current Technology for Shale Gas and Tight Gas Exploration and Production

Unit-5 [6]

Issue and Challenges to Enhance Supply of Natural Gas.

Enhanced Oil Recovery Methods (TPE-604)

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Unit 1 **[6]**

Introduction to EOR, Reservoir Engineering aspects of enhanced recovery methods, Principles and Mechanism, Screening criteria, Macroscopic displacement of fluids, Areal sweep efficiency, Vertical sweep efficiency Displacement efficiency, mobility ratio, well spacing.

Unit 2 **[8]**

Water flooding, Fractional flow equation, Frontal advance theory, Concept of pattern flooding, recovery efficiency, permeability heterogeneity, Polymer flooding

Unit 3 **[10]**

Flow of miscible fluids, Conditions of miscibility, miscible displacement processes. Carbon dioxide flooding Surfactant flooding, Mobilization of residual oil, Adsorption on solid and liquid interface, micelles and micro-emulsion, Micellar flooding.

Unit 4 **[8]**

Miscible displacement processes – miscibility condition, high pressure gas injection, enriched gas injection, LPG flooding, alcohol flooding. Thermal flooding processes: Hot water flooding, Steam flooding, Insitu combustion, Profile modification, air requirement, combustion front monitoring, Microbial EOR.

Oil and Gas Well Testing (TPE-605)

L T P
3 1 0

Unit 1 [6]
Introduction to Oil and Gas well testing, Drill stem testing, RFT, Wire-line Testing System, Interpretation

Unit 2 [6]
Flow of compressible fluid through porous media, unsteady state, semi-steady state fluid flow equations, diffusivity equation, Solution techniques

Unit 3 [10]
Pressure-transient tests: pressure draw-down, build-up test, interpretations; skin factor.

Unit 4 [8]
Multi-rate test, Reservoir limit test, Injection and fall-off test, interference testing, pulse testing.

Unit 5 [10]
Type curves: generation and interpretation, Gas well testing, fractured wells, dual porosity reservoirs.

Principles of Management THU-608

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UNIT1

INTRODUCTION TO MANAGEMENT: Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT 2

MANAGEMENT INFORMATION: Interaction with external environment. Managerial decision making and MIS.

UNIT 3

PLANNING APPROACH TO ORGANIZATIONAL ANALYSIS: design of organization structure; job design and enrichment; job evaluation and merit rating.

UNIT 4

MOTIVATION AND PRODUCTIVITY: Theories of motivation, leadership styles and managerial ordination, monitoring and control in organizations. Techniques of control. Japanese management techniques.

- Minor Project: submission of 15 pages of Case studies on above.

Petroleum Engineering Lab-III (PPE-651)

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(Minimum 8 experiments from the following to be conducted)

1. Determination of specific gravity and viscosity of crude oil.
2. Determination of water content of crude oil by Dean and Stark Apparatus.
3. Determination of Cloud Point and Pour Point of crude oil.
4. Determination of Flash Point and Fire Point of crude oil.
5. Crude oil analysis for asphaltenes and resin content.
6. Determination of crude oil distillation characteristics.
7. Study related to ASTM distillation characteristics of petroleum products.
8. Determination of Reid Vapour pressure of products.
9. Stability of crude oil emulsion.
10. Liquid Chromatography of crude oil.

Project-I (PPE652)

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It will be a minor project. Students will have to submit a case study of their field of interest. They may form a group of maximum 4. Marks will be awarded based on the content, knowledge and presentation of the same.

Composite Viva Voce-I (PPE653)

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Students will be awarded marks by judging their technical knowledge and skills upto VI semester.

Objectives for this module:

- ❖ To develop inter personal skills and be an effective goal oriented team player.
- ❖ To develop professionals with idealistic, practical and moral values.
- ❖ To develop communication and problem solving skills.
- ❖ To re-engineer attitude and understand its influence on behavior.
- ❖ Make the students job ready.

Unit 1

1. **Leadershipskills:** Skills for a good Leader, Assessment of Leadership Skills
 - a. Persuasive skills
 - b. Know your priorities
 - c. Coordination and organizational behavior
 - d. Team building: Necessity of Team Work Personally, Socially and Educationally
 - e. Innovative thinking
 - f. Decision making.
 - g. Stress Management:Causes of Stress and its impact, how to manage & distress, Circle of control, Stress Busters.
2. **Importance of social networking.**
3. **Performance Appraisal:** Performance Appraisal Techniques and their relative merits and demerits. To clarify the concepts related to Performance Appraisal and create an awareness regarding its method of implementation in the context of its contribution to personality development.
4. **Body Language:** Importance of body language and gestures.

Unit 2

1. **Objectives of Discussions and conversations:**
 - a) Different types of GD's.
 - b) Discussion on the different personality traits gauged in a GD.
 - c) Do's & Don'ts of GD.
 - d) Tips on how to crack a GD.
 - e) Dress Code & Importance of body language in a GD.
 - f) Knowledge on different GD topics:
 - Environment & Business
 - General Interest
 - Management Topics
 - Creative Topics
 - Social Topics
 - Politics
 - Sports
 - Education.

2. Interview Clearing Skills:

- a) Importance and selection procedure in Interviews
- b) Types of Interviews.
- c) Do's & Don'ts of an interview.
- d) Key Questions along with their tentative answers.
- e) Body Language.
- f) Dress Code.
- g) Handling different situations during an interview.
- h) Mock interview sessions.

3. Final Evaluation.

**Seventh Semester
Petroleum Engineering Design-II (TPE-701)**

**L T P
3 1 0**

Unit I: Specification of optimum production rate from a well.	[6]
Unit II: Specification of optimum separation process and system for a given type of oil production.	[8]
Unit III: Design of gas-lift valve string for continuous and intermittent gas-lift systems.	[12]
Unit IV: Design of sucker-rod pumping system.	[6]
Unit V: Choice of submersible centrifugal pump capacity and power.	[6]

-

Reservoir Simulation (TPE-702)

L T P
3 1 0

Unit 1 [6]
Model type: Physical, analog and mathematical. Single-phase, multi-phase in one, two and three dimension mathematical model for reservoir fluid flow. Grid blocks and Grid orientation.

Unit 2 [6]
Model Equations: Black oil and composition oil models, Pseudo functions. Data Preparation: Rock, fluid, mechanical, production and validation.

Unit 3 [10]
Solution Techniques: Analytical and numerical methods, explicit and implicit methods of discretization, finite-difference and finite element method, linearization, solution of simultaneous equations.

Unit 4 [8]
Stability criteria, Iterative methods, IMPES & IMPIS methods. Numerical dispersion. Grid and time step size selection. History matching: Manual and automated system Reservoir performance using simulation approach.

Unit 5 [10]
Simulating special processes: Compositional simulation, Miscible displacement, chemical and polymer flooding, thermal recovery processes.

Petroleum Refining and Petrochemicals (TPE-703)

L T P
3 0 0

- Unit 1** [6]
Crude oil evaluation, choice of crude types for a product mix.
- Unit 2** [8]
Distillation system: pipe still heater, distillation column, heat exchangers condenser, reflux control, pressure control, vacuum distillation system.
- Unit 3** [8]
Other refining processes: cracking, reforming, alkylation, isomerization, hydro processing.
- Unit 4** [8]
Specialty products: Lube oil production, propane de-asphalting, solvent extraction, dewaxing, coke and carbon black production.
- Unit 5** [10]
Petro-chemical feed stock: BTX, olefins: method ethane and butane treated products from natural gas, storage and safety measures: Floating roof tank, spherical storage vessels; fire safety measures.

Professional Development: Campus to Corporate (TPE-704)

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Unit 1 [8]

Industrial Scenario, Engineering Education and expectations of competences from an engineer by employer

Personality types, characteristic and features for a successful engineer

Unit 2 [8]

Professional Engineer desirable values and ethics and their development, Relation between engineering profession, society and environment

Managing project

- Leadership
- Motivation
- Time management
- Resource management
- Computer Software
- Interpersonal relationship
- Engineer economics and fundamentals

Unit 3 [8]

Effective Communication

- Listening
- Speaking
- Writing
- Presentation Technique/Seminar
- Group discussion

Preparing for Employment

- Searching for job/job hunting
- Resume Writing
- Interview technique in personal interview telephonic interview, panel interview, group interview, video conference

Unit 4 [8]

Managing Self

- Managers body, mind, emotion and spirit
- Stress Management
- Conflict resolution

Continuing professional development

- Organising learning and knowledge
- Use of computer for organising knowledge resource

Unit 5 [8]

Creativity, Innovation and Intellectual property right

- Concept and need in present time for an engineer

Basic rules, laws and norms to be adhered by engineers during their working

Elective-I

Elective-I (any one)

1. Remote Sensing and GIS
2. Fundamentals of Rock Mechanics
3. Disaster Management
4. Corrosion Engineering

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3 1 0

Remote Sensing & GIS (TCE-071)

Remote Sensing

Unit-1

10

Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics

Unit-2

10

Geostationary and sun-synchronous, Earth Resources Satellites, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing.

Geographical Information System (GIS)

Unit 3

10

Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS,

Unit-4

05

Linkage between spatial and non spatial data, Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis,

Unit-5

05

Errors in GIS, Integration of RS and GIS data, Digital Elevation Model, Network Analysis in GIS, GIS Software Packages.

Fundamental of Rock Mechanics(TCE-072)

Unit 1 [8]

General Geology: Importance of Engineering. Geology applied to Engineering. Practices, Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

Unit 2 [8]

Rocks & Minerals : Minerals, their identification, igneous, sedimentary & metamorphic rocks.

Classification of rocks for engineering purposes. Rock quality designation (RQD).

Unit 3 [8]

Engineering properties of rocks and laboratory measurement : Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature

Unit 4 [8]

In-situ determination of Engineering Properties of Rock masses: Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses, bore hole test

Unit 5 [8]

Stresses around borehole, and borehole failure criteria:

Stresses around a borehole – general linear elastic solution Stresses around a borehole in a poro-elastic formation, Borehole failure criteria

Reservoir Compaction: Subsidence and well problems

Compaction of the reservoir, Stress changes in depleting reservoirs, Consolidation Theory

Disaster Management(TPE-071)

Unit 1 [8]

Concepts of safety – Hazard classification chemical, physical, mechanical, ergonomics, biological and noise hazards – Hazards from utilities like air, water, steam. Hazard identification - Safety Audits - Checklists - What if Analysis – HAZAN – HAZOP - Vulnerability models - Event tree and Fault tree Analysis - Past accident analysis - Flixborough - Mexico - Bhopal - Madras - Vizag accident analysis.

Unit 2 [8]

Hazops: Principles - Risk ranking - Guide word - Parameter - Deviation – Causes - Consequences - Recommendation - Coarse HAZOP study - Case studies - Pumping system -Reactor System - Mass transfer system.

Unit 3 [8]

Introduction to Consequence Analysis - Fire and Explosion models: Radiation - Tank on fire -Flame length –Risk analysis- Radiation intensity calculation and its effect to plant, people &property, UCVCE -Explosion due to - Deflatration - Detonation - TNT, TNO & DSM model – Over pressure. Methods for determining consequences effects: Effect of fire- Effects of explosion - Risk contour - Flash fire - Jet fire - Pool fire - BLEVE - Fire ball.

Unit 4 [8]

Safety in plant design and layout – Safety provisions in the factory act 1948 – Indian explosiveact 1884 – ESI act 1948 – Advantages of adopting safety laws.Safety measures in handling and storage of chemicals – Fire chemistry and its control –Personnel protection – Safety color codes of chemicals.

Unit 5 [8]

Risk Management & ISO14000: Overall risk analysis - Generation of Meteorological data -Ignition data - Population data. Overall risk analysis – E and FI model— Disaster managementplan – Emergency planning – Onsite and offsite emergency planning – Risk management – Gasprocessing complex, refinery – First aids.

Corrosion Engineering(TPE-072)

Unit 1

[8]

Corrosion in oil and gas production. Introduction to corrosion control. Definitions: Materialsinvolved. Basic corrosion principles, corrosion rate. Electrochemical reactions. Electrodepotentials-passivity-temperature-pressure-velocity-conductivity-pH-dissolved gases.

Unit 2

[8]

Forms of corrosion-uniform-pitting-Galvanic erosion-Intergranular and weld corrosion, selectiveLeaching, stress corrosion. Hydrogen embitterment-Fatigue. Role of oxygen in oil filedcorrosion-downhole and surface equipment-water flood Removal of oxygen, analysis andcriteria for control.

Unit 3

[8]

Role of carbon dioxide (CO₂) in corrosion-Effect of temperature and pressure Corrosion of welltubing and other equipment. Role of hydrogen sulphide (H₂S)-Corrosion in downhole, surface,storage and pipelines.

Unit 4

[8]

Corrosion prevention-Cathodic protection. Principles of operation-applications Galvanic systems, corrosion prevention-coatings-corrosion prevention inhibitors-types of corrosion inhibitors-choice and selection.

Unit 5

[8]

Oil treatment corrosion-crude oil properties-desalting-distillation and other processing casehistories, sweetening processes-subsea systems corrosion. Inspection and corrosionmonitoring case history-oil storage tank corrosion-Oilfield and oil treating facilities-offshoreplatforms-down hole equipments.

Project-II (PPE-751)

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It is major project Phase-I. students will be evaluated by the committee comprising of the following:

- | | |
|--------------------------|-----------------------|
| 1. Head of department | Chairman of committee |
| 2. Faculty in-charge | Member |
| 3. Other faculty members | Members |

Work to be done:

- Professional Presentation
- A Report on the same has to be prepared and presented.

Note:

- Faculties may use their discretion to choose topics relevant and suitable to the needs of students.
- Not more than four students to work on each project.
- Students may be assessed by their performance both in oral presentation and written report.

Seminar (PPE-752)

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Marks will be awarded to students on the basis of a power point presentation presented by them on any technical topic of their choice related to the branch. (Minimum 10 minute maximum 15 minute).

Evaluation will be done by faculties on the basis of topic selected, knowledge and presentation skills.

Industrial Training Evaluation (PPE-753)

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During summer vacation after VI semester students are compulsory required to attend industrial training of 4-6 weeks which will be evaluated in VII semester under Industrial Training Evaluation.

Evaluation will be done on the basis of report submitted, presentation given and a viva voce taken by the respective faculty(ies).

Extra Academic Activities (PPE-754)

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Students will be awarded marks on the basis of their behavior in class and general proficiency.

EighthSemester

Health, Safety and Environmental Management in Petroleum Operations (TPE-801)

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Unit 1 [8]

Health hazard: Toxicity, physiological, asphyxiation, respiration and skin effects. Effects of sour gases (H₂ S and CO) on human health. Effect of corrosive material and atmosphere during sand control, fracturing and acidization operation.

Unit 2 [10]

Safety analysis: Operational risk in drilling, production and handling of oil and Gas, fire Hazard: safety in drilling, production operations. Manual and automatic shut down systems, blow down systems. Gas leakage, fire detection and suppression systems. Hazard and failure mode analysis: disaster and crisis management.

Unit 3 [8]

Environment Health and Safety Management, Impact of oil and gas on air, water and soil pollution, impact of drilling and production operations, offshore problems, oil-spill control. Environmental impact assessment. Waste treatment & Management methods, effluent water treatment and disposal. Contaminated soil remediation.

Unit 4 [8]

Noise pollution and remediation measure. Industrial Accident & prevention: Safety sampling, Accident and Safety Audit; Legal requirements , Disaster Planning and control. Safety in offshore operations.

Unit 5 [8]

Gas detection fire detection and suppression, personal protection measures. Occupational Physiology: Respiratory and skin effect. HSE regulation; oil mines regulations.

Industrial Economics (TPE-802)

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Unit 1 [8]

Financial Accounts: Profit and loss account, Balance sheet; elements, preparation and analysis, depreciation, depletion accounting.

Unit 2 [8]

Equipment cost estimation, cost index, utilization, cash flow analysis, time value of money, discounting.

Unit 3 [8]

Profitability analysis, IRR, pay out time, present-worth estimation. Choice between alternative investments.

Unit 4 [8]

Cost index plant cost estimation. Operational cost estimation: Elements, Cost Index, Plant Cost estimation.

Unit 5 [8]

Taxation norms, accounting method, Risk and uncertainty accounting, Petroleum contracts; NELP Production sharing contract.

Elective-II (TPE-081 or TPE-082)

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Well Stimulation (TPE-081)

- Unit 1** [8]
Chemical Properties of Oil-bearing formations and fluids; Rock composition & mineralogy, clays, surface charge, charge exchange capacity, formation water, crude oils.
- Unit 2** [8]
Physical properties of formation materials: Mechanical properties and Thermal properties. Chemical and Mechanical properties of injected fluids: polymer solution. Entry hole diameter, Perforating for Hydraulic fracturing.
- Unit 3** [8]
Hydraulic Fracturing: Dynamic fracture Geometry: Orientation, vertical, horizontal and penny-shaped Fluid loss, fracture conductivity, Proppant fracturing, acid fracturing.
- Unit 4** [10]
Well Productivity: design and optimization of fracturing processes, Acidization: Methods, Rates of reaction, Sand Stone Acidization Design consideration in Matrix acidizing.
- Unit 5** [6]
Designing Matrix acidizing in carbonates. Acid additives. Sand Control : Gravel Packing. Sand consolidation.

Fluid Flow Through Porous Media (TPE-082)

- Unit 1** [6]
The physical medium relevant physical phenomena. Pore scale versus continuum scale, fluid and porous matrix properties.
- Unit 2** [6]
Mathematical models of porous media: network models, Statistical descriptors, Fractal models, effective medium, mixture theory, double porosity models.
- Unit 3** [6]
Balance principals: mass momentum and energy conservation, equations of motion, Darcy's law. Constitutive theory.
- Unit 4** [6]
Boundary values problems: well-posed problems, boundary condition, common solution procedures.
- Unit 5** [10]
Immiscible multiphase flow surface chemistry, thermodynamics of interphase, interfacial tension, capillary pressure, simultaneous of two fluids Surface phenomena: adsorption wetting thin films. Transport through membranes. Miscible displacement and dispersion.

Elective-III (TPE-083 or TPE-084)

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Oil and Gas Transportation System (TPE-083)

Unit 1 [6]

Road and rail transport of crude oil & product. Tanker design, safety features. Oceanic transport of oil and liquefied natural gas: design of ocean going tankers and safety features.

Unit 2 [8]

Pipe line transport of oil and gas: Route selection, pipe line construction process and equipment: trenching, aligning, connecting pipes, corrosion protection, lowering & back filling.

Unit 3 [8]

Flow of oil and gas: through pipelines. Pressure drop calculation types, sizing and location of pumps and compressor. Instrumentation and control.

Unit 4 [8]

Flow measurement and control arrangement. Corrosion in pipelines: Types, chemical and electro-chemical process; coating, cathodic protection principle and design.

Unit 5 [10]

Pipe line branching: Gas distribution control. Offshore pipe line: Sag and overbend; stinger and riser, under-water welding.

Oil and Gas Marketing and Resource Management (TPE-084)

Unit 1 [8]

Introduction: The development of Oil & Gas Industry, Structure of oil & Gas Industry, Introduction to Indian Oil & Gas Industry, India hydrocarbon vision 2050. Petroleum resource classification, Analysis of resource management.

Unit 2 [8]

Natural Gas: What is Natural Gas, Measuring Natural Gas, Pipeline quality Natural Gas. Demand, Supply & Storage of Natural Gas: Gas Production, Sources of demand in India, Supply system, Pipeline operations & network, Storage of Natural Gas, Liquefied Natural Gas Plant & Operations, Gas Scale pattern in India, Gas regulation in India, Gas trading and gas pricing.

Unit 3 [8]

Coal Bed Methane: Introduction, Present status of Coal Bed Methane, CBM storage and scale, CBM pricing in India. Crude Oil production in India, Crude oil Specification, measuring / Custody transfer of crude Oil, Crude Oil transportation, Crude Oil production in India, Crude Oil refineries, products from Crude Oil.

Unit 4 [8]

International & National Institution of Oil & Gas: OPEC, OIIB, DGH, PNGRB, CHT, PII, PPAC, PCRA. Petroleum Contracts: NEPL- Role & Background, Types of Contracts and fiscal components, production sharing contracts in India, Crude Oil trading and pricing, CBM Contracts and Shale Gas Contracts.

Unit 5**[8]**

Trade practices & Taxation: Norms on various trade practices, Element of Petroleum Development Policy, Financial and taxation issue. Risk Management: Source of risk, managing risk by risk reduction, diversification, and uncertainty and decision analysis by decision tree.

Human Values and Ethics(TPE-803)

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Unit 1 [8]

HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

Unit 2 [8]

ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

Unit 3 [8]

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

Unit 4 [8]

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

Unit 5 [8]

GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility

Project-III (PPE-851)

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It is major project Phase-II. Students will be evaluated by the committee comprising of the following:

- | | |
|--------------------------|-----------------------|
| 1. Head of department | Chairman of committee |
| 2. Faculty in-charge | Member |
| 3. External examiner | Member |
| 4. Other faculty members | Members |

Work to be done:

- Professional Presentation
- A Report on the same has to be prepared and presented.
- Demonstration of project in front of committee.

Note:

- Students may be assessed by their performance both in oral presentation and written report and the viability of the project work done.

Seminar (PPE-852)

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Marks will be awarded to students on the basis of a power point presentation presented by them on any technical topic of their choice related to the branch. (minimum 10 minute maximum 15 minute).

Evaluation will be done by faculties on the basis of topic selected, knowledge and presentation skills.

Composite Viva-Voce-II (PPE-853)

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Students will be awarded marks by judging their technical knowledge and skills upto VI semester.

