

20PEB124					ELEMENTS OF ENGINEERING					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- Demonstrate the fundamentals of civil, electrical and mechanical engineering
- Improve analytical skills to repair/report malfunctions of engine parts accurately.
- Improve skills for site preparation before petroleum exploration activities.
- Improve skills to deal with minor electrical works.

Unit I

Hours: 9

Introduction : Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law. **Properties of Gases**: Gas laws, Boyle's law, Charles's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process. **Properties of Steam**: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters. **Heat Engines**: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankin; Otto cycle and Diesel cycle. **Steam Boilers**: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

Unit II

Hours: 10

Internal Combustion Engines: Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies. **Pumps and Air Compressors**: Types and operation of Reciprocating, Rotary and Centrifugal pumps. Types and operation of Reciprocating and Rotary air compressors. **Refrigeration & Air Conditioning**: Refrigerant, Vapour compression refrigeration system, vapours absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners. **Couplings and Brakes**: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc). **Transmission of Motion and Power**: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.

Unit III

Hours: 10

Introduction to Civil Engineering: Branches of Civil Engineering, Scope of Civil Engineering. **Surveying Levelling and Mapping**: Definition of Surveying, Aims and applications, Fundamental principles of surveying, Classification of surveying, Plans and maps, Scales, Units of measurement. Methods of Linear measurement, Instruments used in chain surveying, Selection of stations, Chaining, Ranging, Offsetting, Errors in chaining and correction. Methods of angular measurements, Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing and correction of bearings for local attraction. Aims and applications of levelling, Definition of various terms, Instruments for leveling, Methods of leveling, Recording observations in level-book, Computing reduced levels by HI and rise & fall method. Introduction to planimeter, introduction to Global positioning system (GPS), remote sensing (RS) and Geographical information system (GIS), Beam bending, bending of composite beams, transverse shear, combined loadings, deflection of beams and shafts, stress in columns.

Unit IV

Hours: 10

Elementary Concepts: Introduction of Electrical Current, Voltage, Power and Energy; Sources of Electrical Energy – Independent and Dependent Source, Source conversion; Ideal electrical circuit elements - Resistor, Inductor and Capacitor; Fundamental laws of electric circuits - Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits; Star – Delta conversion. **Electrostatics**: Electric charge and Laws of electrostatics; Definitions - Electric field, lines of force, electric field intensity, electric flux and flux density; Electrostatic induction; Gauss's law and its application; Dielectric strength; Capacitor; Capacitor in series and parallel, Energy stored in a capacitor. **Electromagnetism**: Faradays Laws; Lenz's Law; Fleming's Rules; Effect of magnetic field on current carrying conductor; Magnetic circuits; Statically and dynamically induced EMF; Concepts of self inductance, mutual inductance and coefficient of coupling; Inductance in series and parallel; Hysteresis and Eddy current losses; Energy stored in magnetic fields. **Single Phase A.C. Circuits**: Generation of sinusoidal voltage, Definition of average value, root mean square value, form factor and peak factor; Phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, R-L, RC and R-L-C circuits; Concepts of Real power, Reactive power, Apparent power and Power factor, Series, Parallel and Series - Parallel circuits; Power in AC circuit, Power factor improvement; Resonance in series and parallel circuits, Qfactor, Bandwidth and Selectivity. **Safety Protections**: Circuit protection devices: Fuses, MCB, ELCB & Relays.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1- Implement the fundamentals of mechanical systems and analyze various heat engines cycles and for oil and gas applications.
CO2- Apply fundamentals of properties of gas and steam in designing the plant equipment or steam injection process for enhance oil recovery.
CO3- Select and identify the problems by understanding construction and working of engines, pump, compressors, air conditioning and power transmission devices and select them for specific application.
CO4- Apply the basic knowledge of electric circuits, electrical and electronic fundamentals to formulate solutions to the problems related petroleum equipment.
CO5- Develop the building layouts and other infrastructure, sub-surface geological maps and demonstrate understanding of transportation system, water conservation.

TEXT / REFERENCE BOOKS

1. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
2. Engineering Thermodynamics by R.K.Rajput, EVSS Thermo Laxmi Publications
3. Surveying and Leveling by N. N. Basak, Tata McGraw Hill Education, Pvt. Ltd. New Delhi
4. Elements of Civil Engineering by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.
5. Electrical Technology, Vol – 1, by B.L. Theraja, S. Chand.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each-No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks