First Year Curriculum

Admission Year 2026-27

Bachelor of Technology
Petroleum Engineering

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 1

(1)

a) **Course Name:** Physics of Wave and Motion

b) **Course Code:** 03019201B S02

c) **Prerequisite:** Knowledge of Physics and some basic concepts in Mathematics like differentiation, integration, limit, differential equation, vector calculus up to 12thscience level.

d) **Rationale:** Knowledge of physics is essential for all Engineering branch because physics is the foundation subject of all the branches of engineering and it develops scientific temperament and analytical capability of engineering students. Comprehension of basic physics concepts enables the students to solve engineering problem logically and develop scientific approach.

e) **Course Learning Objective:**

CLOBJ 1	To understand the mechanical and thermal properties of materials, including elastic behavior, stress–strain relationships, heat transfer mechanisms, and solid-state models.
CLOBJ 2	To apply principles of mechanics to analyze motion in a plane, including rigid body dynamics, rotational motion, and the effects of forces, constraints, and friction.
CLOBJ 3	To develop knowledge of wave motion and vibration, including transverse and longitudinal waves, wave equations, and acoustic behavior in engineering systems.
CLOBJ 4	To analyze sound-related phenomena such as reflection, reverberation, and absorption, and apply acoustic principles in building and mechanical system design.
CLOBJ 5	To understand the fundamentals of laser physics, including matter–radiation interaction, laser types, and their engineering and industrial applications

f) **Course Learning Outcomes:**

CLO 1	To conceptualize mechanical and thermal properties of materials.
CLO 2	To develop the understanding of planar motion and mechanics of rigid body
CLO 3	To develop the theoretical and practical aspects on origin and propagation of waves and vibration.
CLO 4	To demonstrate working of Lasers and their applications.

g) **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
3	-	2	4	40	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Properties of Material Mechanical Properties**: Elastic properties, Model of elastic behavior, tensile stress-strain curve, shear strength of perfect and real crystals. **Thermal Properties**: Thermo-electric effects, Wiedemann-Franz law, Phonons, Modes of heat transfer, Specific heat of solids, Einstein and Debye Model.	20	9
2	**Motion in a Plane** Transformation of coordinates, Newton's laws and its completeness in describing particle motion, Problems including constraints and friction, Motion of a rigid body in the plane; Rotation in the plane; Angular momentum about a point of a rigid body in planar motion.	20	9
3	**Waves & Vibration** Transverse wave on a string, Wave equation on a string, Harmonic waves, Standing waves and their Eigen frequencies, longitudinal waves and the wave equation, Acoustics waves and speed of sound, Phase velocity and group velocity. Acoustics of Civil structure and mechanical system: Reflection of sound, Echo, Reverberation, Reverberation time, Absorption of sound, Absorption coefficient, Sabine's formula Condition forgood acoustic of the building, Engineering applications of ultrasound-non-destructive testing.	20	9
4	Lasers Einstein's theory of matter-radiation interaction, Absorption, Spontaneous and Stimulated Emission of Radiation, Characteristics of Laser, Components of Laser, Types of Laser: Nd:YAG Laser, CO2 Laser, Diode Laser, Applications of Lasers.	35	15

i) Text Book and Reference Book:

1. " Engineering Mechanics (TextBook)
   By MK Harbola
2. Engineering Mechanics - Dynamics
   By JL Meriam
3. Mechanical Vibrations
   By JP Den Hartog
4. Engineering Physics (TextBook)
   By HK Malek and A.K.Singh | - Mc Graw Hill Publication

j) List of Practicals

Sr. No.	Practical
1	I-V characteristics of light emitting diode in forward bias.
2	I-V characteristics of Zener diode in reverse bias.
3	Determination of Velocity of ultrasonic waves in water.
4	Determination of Dielectric constants of Dielectric samples.
5	Measurement of Band gap of semiconductor material.
6	Measurement of Hall coefficient and carrier concentration in semiconductor material.
7	Measurement of Planck's constant using LED.
8	Measurement of wavelength of laser light using diffraction grating.
9	Measurement of Numerical aperture of an optical Fiber.
10	Determination of the size of lycopodium powder particles.

(2)

a) Course Name: Linear Algebra and Calculus
b) Course Code: 03019101BS02
c) Prerequisite: Elementary Algebra, Matrices, Differentiation and Integration
d) Rationale: This syllabus builds essential mathematical tools for engineering applications, covering differential equations, Laplace transforms, and vector calculus.
e) Course Learning Objective:

CLOBJ 1	To develop understanding of matrices, determinants, and techniques for solving systems of linear equations, along with eigenvalues and eigenvectors.
CLOBJ 2	To apply methods for solving first-order ordinary differential equations and model real-life engineering problems such as cooling, growth, and electrical circuits.
CLOBJ 3	To understand functions of multiple variables and apply concepts of partial differentiation in analyzing physical and geometric problems.
CLOBJ 4	To analyze and solve problems involving maxima and minima, tangent planes, and normal lines using partial derivatives.
CLOBJ 5	To evaluate double and triple integrals and apply them to compute areas, volumes, and other engineering quantities.

f) Course Learning Outcomes:

CLO 1	Understand the concept of eigenvalues and eigenvectors of a matrix.
CLO 2	Formulate first-order differential equations to solve the real-world problem.
CLO 3	Apply partial differentiation to optimize multivariable function.
CLO 4	Evaluate multiple integration in cartesian and polar coordinates.

g) Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	40	20	0	60		100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Linear Algebra:** Review of Determinant and Matrices, types of matrices, Rank of a matrix, System of Linear equations- homogenous and non-homogenous equations, solving techniques- Gauss Elimination method, Gauss-Jordan method, Consistency and inconsistency of the system, **Eigenvalues and Eigenvector:** Eigenvalues andEigenvector, Algebraic multiplicity and Geometric multiplicity, Caley-Hamilton theorem, Diagonalization	30	18
2	First order ordinary differential equations and applications: Exact and non-exact differential equations, Integrating factor- function of x only and functions of y only, Linear and nonlinear differential equations, **Applications:** Newton's Law of cooling, Growth model and RL-Circuit and RC-Circuit	20	12
3	**Partial Differentiation and its application** **Partial Differentiation:** Functions of several variables, Limit of function, continuity, partial differentiation, chain rule, Implicit functions and their derivatives, Homogeneous functions and Euler's theorem **Applications of Partial Differentiation:** Tangent plane and normal line, Maxima and minima,	30	18
4	**Multiple Integration:** Double integration, change of order, change into polar form, triple integrations **Applications:** Area, Volume	20	12

i) Text Book and Reference Book:

1. **" Advanced Engineering Mathematics (TextBook)**
   By Erwin Kreyszig | Willey India Education
2. **Elementary Linear Algebra**
   By Howard Anton, Chris Rorres | Willy India Edition | 9th Edition
3. **Calculus with early transcendental functions**
   By James Stewart | Cengage Learning
4. **Thomas' Calculus**
   By Maurice D. Weir, Joel Hass, Frank R. Giordano | Pearson Education

(3)

a) Course Name: Basic Electrical Engineering
b) Course Code: 03010601E S01
c) Prerequisite: Standard 12th Science
d) Rationale: Basic Electrical Engineering provides fundamental knowledge of electrical principles, components, and systems that form the backbone of all engineering disciplines. Understanding concepts such as DC and AC circuit analysis, electrical machines, measurement techniques, and safety practices equips students with the skills to interpret, design, and troubleshoot basic electrical systems. This course bridges theoretical understanding with practical applications, enabling learners to apply electrical engineering concepts in multidisciplinary contexts, industrial environments, and further specialized studies.

e) Course Learning Objective:

CLOBJ 1	To understand the fundamental concepts and principles of electrical engineering, including voltage, current, resistance, power, and energy.
CLOBJ 2	To analyze DC and AC electrical circuits using basic circuit laws and network theorems.
CLOBJ 3	To **Apply** knowledge of electrical measuring instruments and circuit components in practical situations.
CLOBJ 4	**Develop** the ability to solve engineering problems related to electrical systems and interpret circuit behavior
CLOBJ 5	**Explain** the operating principles of electrical machines such as transformers, motors, and generators.
CLOBJ 6	**Demonstrate** awareness of electrical safety practices and applications of electrical engineering in real-world systems.

f) Course Learning Outcomes:

CLO 1	Solve basic electrical circuit problems using Ohm's law, Kirchhoff's laws, and network theorems in DC and AC circuits.
CLO 2	Discuss the role and performance characteristics of resistor, capacitor, and inductor in pure R, pure L, and pure C circuits.
CLO 3	Calculate active, reactive, and apparent power using analytical and phasor methods in series RL, RC, and RLC AC circuits.
CLO 4	Analyze the construction and working principle of a transformer under no-load and load conditions.
CLO 5	Assess the construction and operation of DC and AC machines under different loading conditions.
CLO 6	Explain the function and application of various electrical components and protective devices in domestic and industrial electrical systems.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				T	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Course Content

Sr.	Topics	W	T
1	**DC Circuits**Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Mesh and Node analysis, Simplifications of networks using series and parallel combinations and star-delta conversions. Superposition, Thevenin and Norton Theorems.	22	10
2	**AC Circuits**Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of instantaneous, peak (maximum), average and R.M.S. values, frequency, cycle, period, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors, examples based on theory. Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and RLC circuit, concept of impedance, admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, concept of active, reactive and apparent power and power factor, examples based on theory. Concept of three phase supply and phase sequence. Voltages, currents and power relations in three- phase balanced star-connected loads and delta connected loads along with phasor diagrams.	33	15
3	**Transformers**Magnetic effect of an electric current, right hand thumb rule, Concept of m.m.f., flux, flux density, reluctance, permeability and field strength, their units and relationships, comparison between electrical and magnetic parameters. Flemings left hand rule. Self and mutual inductance, Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.	20	9
4	**Electrical Machines**Construction, working and application of DC Motor and Generator. Generation of 3 phase rotating magnetic fields, Construction and working of a three-phase and Single phase induction motor and its types. Construction and working of Synchronous generator.	15	7
5	**Electrical Installations**Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.	10	4
	Total	100	45

i) Text Book and Reference Book:

1. Electrical Technology (Vol-II) (TextBook)
   By B L Theraja & A K Theraja | S Chand
2. Basic Electrical Engineering
   By D. P. Kothari and I. J. Nagrath, | Tata McGraw Hill | 3, Pub. Year 2010
3. Basic Electrical Engineering
   By D. C. Kulshreshtha | McGraw Hill | 1, Pub. Year 2009
4. Fundamentals of Electrical Engineering
   By Leonard S. Bobrow | Oxford University Press | 2, Pub. Year 1996
5. Electrical and Electronics Technology
   By E. Hughes | Pearson | 10, Pub. Year 2010
6. Electrical Engineering Fundamentals
   By Vincent Del Toro | PHI

j) List of Practicals

Exp. No.	Name of the Experiment
1	To Study about Various Electrical and Electronics Symbols and demonstrate various measuring instruments used in Basic electrical Engineering laboratory.
2	To Perform and Solve Electrical Networks with Series and Parallel Combinations of Resistors Using Kirchhoff's Laws
3	Verification of superposition theorem with dc source.
4	Verification of Thevenin's theorem with dc source.
5	Verification of Norton's theorems in dc circuits
6	To Obtain Inductance, Power and Power Factor of the Series RL Circuit With AC Supply Using Phasor Diagram.
7	To Obtain Capacitance, Power and Power Factor of the Series RC Circuit With AC Supply Using Phasor Diagram.
8	To Obtain Inductance, Capacitance, Power and Power Factor of the Series R-L-C Circuit With AC Supply Using Phasor Diagram.
9	Verification of Current and Voltage Relations in Three Phase Balanced Star and Delta Connected Loads
10	Find out the Efficiency and Voltage Regulation of Single Phase Transformer by Direct Load Test.

(4)

a) Course Name: Principles of Communication Skills
b) Course Code: 03010001HM01
c) Prerequisite: Knowledge of English Language studied till 12th standard
d) Rationale: Basic Communication Skills are essential for all Engineers
e) Course Learning Objective:

CLOBJ 1	Understand the fundamental grammatical structures including parts of speech, punctuation, tenses, phrases, clauses, determiners, Quantifiers, sentence types, and basic concepts of phonetics (IPA symbols, speech sounds, stress, and intonation) for accurate and effective language use.
CLOBJ 2	Develop basic reading and listening comprehension skills by using appropriate strategies to understand simple texts and spoken content with improved pronunciation awareness.
CLOBJ 3	Organize and express ideas clearly in written form through picture-based perception activities.
CLOBJ 4	Build confidence and fluency in spoken communication through correct pronunciation practice, meeting and greeting activities, extempore speech, and everyday conversational exercises.

CLOBJ 5	Apply goal-setting and self-reflection techniques to monitor personal language learning progress, pronunciation improvement, and overall communication skills development.

f) Course Learning Outcomes:

CLO 1	Identify and explain parts of speech, punctuation marks, tenses, phrases, clauses, determiners, Quantifiers, sentence structures, and basic IPA phonetic symbols for accurate language use.
CLO 2	Demonstrate effective basic conversational exchanges and short extempore speeches using correct pronunciation, appropriate greetings, logical organization of ideas, and improved fluency.
CLO 3	Apply basic reading and listening strategies to comprehend short passages and spoken texts, recognizing appropriate pronunciation, stress, and intonation patterns.
CLO 4	Analyse personal communication performance and evaluate SMARTER goals through self-assessment and reflective practices to monitor language and pronunciation improvement.
CLO 5	Compose structured short picture-based perceptions by developing clear topic sentences, supporting details, and coherent conclusions with grammatical accuracy.

g) Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
0	**0**	**2**	**1**	**0**	**0**	**20**	**0**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content:

Sr.	**Topics**	**W**	**T**
1	Parts of Speech, Punctuation and Tenses using time line ● Overview of 8 parts of speech ● Basic punctuation marks and their usage ● Types: Present, Past, Future ● Forms and correct usage ● Common tense errors	10	4
2	Introduction to Phonetics-Symbols and Pronunciation ● Introduction to Phonetics and IPA ● English Speech Sounds ● Stress and Intonation	10	4

3	Phrase and Clauses; Types of Sentence (Structure Wise) ● Difference between phrases and clauses ● Classification of Simple, Compound & Complex ● Interchange of Simple to Compound, Simple to Complex, Compound to Complex	8	2
4	Picture Perception ● Observing and interpreting images ● Building a short story or description ● Improving vocabulary and creativity	14	4
5	Determiners and Quantifiers ● Types of determiners ● Order of determiners in a sentence ● Quantifiers with countable and uncountable nouns ● Common errors in the use of determiners and Quantifiers	8	2
6	Meeting and Greeting (Initiating a conversation) • Basic conversation skill • Formal and informal greetings • Common phrases for starting interactions	10	4
7	Reading Comprehension (Level of difficulty-Basic) • Types – Skimming & Scanning • Reading short passages • Identifying main ideas and details • Answering basic questions	10	2
8	Listening Comprehension • Listening to short audios/Conversation • Understanding and responding to key information	8	2
9	Extempore Speech • Speaking on random topics • Organizing thoughts quickly • Improving fluency and confidence	12	4
10	Goal Setting and Tracking • Setting SMARTER goals • Planning and tracking progress • Self-assessment and reflection	10	2

i) Text Book and Reference Book:

1. **English Grammar in Use (TextBook)**
   By Murphy, Raymond | Cambridge University Press, Pub. Year 2019
2. **A Practical English Grammar (TextBook)**
   By Thomson & Martinet | Oxford University Press, Pub. Year 1986
3. **The St. Martin's Guide to Writing**
   By Rise B. Axelrod & Charles R. | Cooper, Bedford/St. Martin's, Pub. Year 2021
4. **Tactics for Listening (Basic)**
   By Jack C. Richards | Oxford University Press, Pub. Year 2011
5. **Active Skills for Reading: Book 1**
   By Neil J. Anderson | Cengage Learning, Pub. Year 2013

(5)

a) **Course Name:** Petroleum Chemistry

b) **Course Code:** 03019501BS02

c) **Prerequisite:** This subject requires the basic Knowledge of chemistry in Petroleum field.

d) Rationale: Petroleum Chemistry is a vital branch of chemistry that focuses on the study of hydrocarbons, their extraction, refining, and applications in energy production, petrochemical industries, and materials science. Given the increasing demand for energy and sustainable alternatives, understanding petroleum chemistry is crucial for developing efficient and environmentally friendly processes in fuel and chemical production.

e) Course Learning Objective:

CLOBJ 1	Understand the origin, formation, composition, and classification of petroleum hydrocarbons along with their physical and thermal properties.
CLOBJ 2	Analyze crude oil characteristics and petroleum evaluation parameters such as API gravity, viscosity, SARA analysis, distillation methods, and emulsion behavior.
CLOBJ 3	Apply principles of extraction and separation techniques used in petroleum processing and evaluate petroleum product properties.
CLOBJ 4	Explain water chemistry, corrosion mechanisms, and corrosion prevention methods used in petroleum and process industries.
CLOBJ 5	Evaluate engineering materials including polymers, paints, refractories, and cementing materials for their applications in petroleum engineering systems

f) Course Learning Outcome

CLO 1	Understand Basics of Chemistry for extraction techniques, solvent recovery, separation mechanisms of solvents for recovery.
CLO 2	Analyze the composition of petroleum through various hydrocarbon groups and their structures
CLO 3	Characterize crude oils and petroleum products through different techniques
CLO 4	Understand fundamental water chemistry concepts and Corrosion concepts
CLO 5	Demonstrate knowledge of Engineering materials focusing on their properties and industrial uses

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	-	2	4	20	20	20	60	20	150

h) Course Content

Course Content

Sr.	Topics	W	T
1	**Unit- I Chemistry of Hydrocarbons:**Origin and formation of Petroleum: Reserves and deposits of Hydrocarbon in India, Composition of crude Oils, ultimate and chemical composition -Hydrocarbon Groups, Complex Hydrocarbons, Poly aromatic and Hydro aromatic -Hydrocarbons or Aromatic Hydrocarbon Compounds, Types of Crude oil, Physical Properties of Crude Oil, Thermal Chemistry of Petroleum Constituents – Waxes/Saturate, Asphaltenes, Resin, Aromatics, scales, Wax deposition mechanism, Crystallization- Problems faced in Petroleum industry, Commonly used crude oil terms like WTI, Brent and OPEC.	25	8
2	**Unit-II Petroleum Analysis and Evaluation**Characterization of crude oils: Cloud point, Pour point, Water content, SARA analysis, TBP and ASTM distillation; Classification by chemical composition; Correlation Index. Density, API gravity, Viscosity, UOP characterization factor, etc. ;Physical & Thermal properties of petroleum; ASTM, TBP, EFV distillation curves, Morphology of Waxes, Rheology of Crude oils, Paraffin 's-Carbon distribution number, Paraffin inhibition Efficiency by Cold finger test. Emulsion, Demulsifiers and Surfactants - Types, Stability, factors affecting and mechanism	25	10
3	**Unit-III General Chemistry**Extraction - Extraction Principle, Extraction Process Definition of Terms Related to Extraction Partition Coefficient Partial Solubility, Solvent Recovery, Separation of Phases, Selectivity, Critical Solution Temperature, Batch Extraction, Continuous Extraction Furtural extraction method, Phenol extraction method, Duo sol extraction process Pyrolysis of petroleum products	10	8
4	**Unit- VI Water Chemistry and Corrosion**Water chemistry: Hardness of water-types, degree of hardness, Effects, causes and prevention methods; numerical problems on hardness of water. Softening of water – Ion exchange, Soda-Lime method, Zeolite/Permutit method, Treatment of water –Breakpoint of chlorination. Corrosion and its prevention: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration (pitting and water line). Corrosion control: Anodizing – Anodizing of aluminum, Cathodic protection - sacrificial anode and impressed current methods, Metal coatings – Galvanization. Corrosion Penetration Rate (CPR), numerical problems on CPR.	20	10
5	**Unit– V Engineering Materials** Definition, Classification of Polymers (Natural and Synthetic) Types of Polymerization, Polymerization Techniques Plastics –Thermosetting and Thermoplastic (Difference) and Properties and uses of Important commercial Plastics– PE,PS, Polypropylene, PVC,PTFE, Epoxy resin). Conducting Polymers, Biodegradable polymers: Introduction and their requirements, Properties and applications Paint – definition, Components and properties of paints. Varnish – definition, properties and examples. Refractories – Definition, Classification, properties and applications. Cementing Materials -Cements: Introduction, Classification of cement and properties, chemical composition of cement, Standards, Manufacturing of Portland cement, chemical constituents of Portland cement, Setting and hardening of cement, PCC & RCC	20	9

	Total	**100**	**45**

i) Text Book and Reference Book:

- James G. Speight – The Chemistry and Technology of Petroleum
  Publisher: CRC Press
- James G. Speight – Handbook of Petroleum Analysis
  Publisher: Wiley/CRC Press
- M. S. Matar and L. F. Hatch – Chemistry of Petrochemical Processes
  Publisher: Gulf Professional Publishing
- John M. Campbell – Gas Conditioning and Processing
  Publisher: Campbell Petroleum Series
- Pierre R. Roberge – Handbook of Corrosion Engineering
  Publisher: McGraw-Hill

j) List of Practicals

1.	To determine the total hardness of the given samples by EDTA titrimetric method.
2.	To estimate moisture content in the given coal sample.
3.	To determine the amount of alkalinity present in the given samples.
4.	To determine the amount of chloride present in the given water sample by Mohr's method.
5.	To determine the saponification value of an oil sample.
6.	Physicochemical Analysis of Crude oil.
7.	To determine the amount of copper in a given brass sample
8.	To study the rate of corrosion by weight loss method.
9.	To find the Pour point and Cloud Point of the Crude oil.
10.	Viscosity measurement using Ostwald's viscometer of (i) polymer (ii) ethanol at RT
11.	Study of Apparent Viscosity and Plastic Viscosity through Fan VG meter

(6)

a) Course Name: Basics of Petroleum Engineering

b) Course Code: 03011701PC01

c) Prerequisite: : Fundamental of Petroleum Engineering

d) Rationale: This subject introduces students to fundamental concepts such as reservoir characterization, drilling technologies, production techniques, and the economic and environmental considerations involved in petroleum extraction.

e) Course Learning Objective:

CLOBJ 1	Understand the fundamental concepts of petroleum exploration including source rocks, reservoir rocks, hydrocarbon migration, and accumulation processes.
CLOBJ 2	Explain the principles and applications of geophysical and geochemical exploration methods such as seismic, gravity, magnetic, and electrical techniques for hydrocarbon exploration.
CLOBJ 3	Apply basic drilling engineering concepts including well planning, drilling operations, rig components, drill bits, casing, and well control systems.
CLOBJ 4	Analyze reservoir engineering fundamentals and evaluate reservoir properties such as porosity, permeability, fluid saturation, wettability, and capillary pressure.
CLOBJ 5	Describe the characteristics of crude oil and natural gas and understand basic production engineering methods used in hydrocarbon extraction and production.

f) Course Learning Outcome

CLO 1	Explain the key concepts of petroleum exploration including source, reservoir, migration, and the various geophysical and geochemical techniques used in hydrocarbon exploration.
CLO 2	Describe the components and functions of a rotary drilling rig, and explain the basic drilling operations including well planning, drilling methods, and drill bit classification.
CLO 3	Analyze reservoir rock properties such as porosity, permeability, fluid saturation, and their significance in evaluating petroleum reservoirs.
CLO 4	Identify the physicochemical properties and classification of crude oil and natural gas and provide an overview of common production methods used in the petroleum industry.

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	-	-	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Course Content

Sr.	**Topics**	**W**	**T**
1	Introduction of Petroleum Exploration Ingredients of petroleum exploration, concept of source, reservoir, migration. Techniques of petroleum exploration, geochemical, gravity, magnetic, electrical and seismic method of hydrocarbon exploration. Fundamentals of seismic processing, interpretation and attribute: Body waves and surface waves, Rayleigh, love, p and s wave, seismic acquisition principle, seismic refraction and reflection surveys.	**25**	**10**

2	Basic of Drilling Engineering: Well Planning: Introduction to oil well drilling, Drilling planning approaches. Rotary Drilling Method: Rig parts, selection and general layout. Introduction drilling operations & Practices: Hoisting, Circulation, Rotation, Power system, Well Control System. Drill Bits: Classification of drag, rotary, roller, diamond and PDC bits, Bit Selection. Types of Casing String and Drill String	**30**	**15**
3	Overview of Reservoirs Engineering Fundamentals of petroleum, petroleum reservoir, reservoir engineering, classification of petroleum reservoir. Introduction reservoir rock properties: porosity, permeability, combination of permeability in parallel and series beds, porosity permeability relationship, effective and relative permeability, fluid saturation and significance, wettability, capillary pressure, surface tension /interfacial tension.	**30**	**15**
4	Introduction production engineering Characteristics of crude oil and natural gas, properties of natural gas, classification of crude and its physicochemical properties. Overview of different production methods.	**15**	**5**
	Total	**100**	**45**

i) Text Book and Reference Book:

- Introduction to Sedimentology, (TextBook)
  By Supriya Mohan Sengupta, | A.A.Balkema publication
- Applied Geophysics, (TextBook)
  By Telford, W M, Geldart, L.P., Sheriff, R.E. and Keys, D.E. | Oxford and IBH Publishing Co Pvt Ltd.
- Applied Petroleum Reservoir Engineering, (TextBook)
  By B.C. Craft, M. Hawkim, | Prentice Hall, 1991.
- Applied Drilling Engineering, Society of Petroleum Engineers. (TextBook)
  By Bourgoyne , Adam T. Jr., Martin E. Chenevert, Keith K. Millheim and F.S. Young Jr., Richardson, T
- Oil Well Drilling Engineering Principles and Practices, (TextBook)
  By H Rabia (1986) | Kluwer Law International

Semester 2

a) **Course Name:** Sedimentary and Petroleum Geology

b) **Course Code: 03011702PC01**

c) **Prerequisite:** Fundamentals of sediments and basics of Petroleum Engineering.

d) **Rationale:** This subject equips students with the knowledge to interpret sedimentary environments, identify reservoir rocks, source rocks, and seals, and apply geological principles to hydrocarbon exploration.

e) Course Learning Objective:

CLOBJ 1	Understand the processes of weathering, sediment transport, deposition, and the development of sedimentary textures and structures.
CLOBJ 2	Classify and analyze sedimentary rocks, their diagenetic processes, and various depositional environments influencing reservoir characteristics.
CLOBJ 3	Explain the origin, generation, thermal evolution, and migration mechanisms of petroleum and natural gas within petroleum systems.
CLOBJ 4	Evaluate the effects of geological factors such as temperature, pressure, and subsurface conditions on hydrocarbon generation and migration.
CLOBJ 5	Identify and interpret different petroleum traps, cap rocks, and sedimentary basins with emphasis on petroleum-producing basins of India.

f) Course Learning Outcome

CLO 1	Explain the key concepts of petroleum exploration including source, reservoir, migration, and the various geophysical and geochemical techniques used in hydrocarbon exploration.
CLO 2	Describe the components and functions of a rotary drilling rig, and explain the basic drilling operations including well planning, drilling methods, and drill bit classification.
CLO 3	Analyze reservoir rock properties such as porosity, permeability, fluid saturation, and their significance in evaluating petroleum reservoirs.
CLO 4	Identify the physicochemical properties and classification of crude oil and natural gas and provide an overview of common production methods used in the petroleum industry.

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	-	-	3	20	20	-	60	-	100

h) Course Content

Course Content

Sr.	Topics	W	T
1	**Sedimentology** Subaerial weathering processes: physical and chemical weathering; distinction between soil, alluvium and sediments; Transport and deposition of sediments: fundamentals of fluid flow, particle transport by fluids and by sediment gravity flows. Sedimentary textures: grain size, particle shape, sorting and fabric and their effect on porosity and permeability of sedimentary rocks; sedimentary structures: stratification and bedforms, bedding plane markings; paleocurrent analysis	**20**	**8**
2	**Sedimentary Rocks and Depositional Environments** Diagenesis of siliciclastic sedments. Classification of siliciclastic sedimentary rocks: rudaceous, aranaceous, and luteceous sedimentary rocks; carbonate sedimentary rocks: textures, classification, diagenesis; other nonclastic sedimentary rocks: evaporites, cherts, coal, oil-shale. Introduction to different types of sedimentary basins. Introduction to depositional environments; continental (fluvial, lake, aeolian), marginal marine (estuarine, lacustrine), shallow marine (tidal flat, beach, deltaic), shelf and deep marine environments.	**25**	**11**
3	**Origin and Migration of Petroleum** Introduction to petroleum system. Theories of inorganic, Organic and duplex origin of petroleum. Conversion of organic matter to petroleum: diagenesis of organic matter and formation of kerogens, pristine and phytane; classification of kerogens; catagenesis, and metagenesis of kerogens; thermal maturity indicators. Classification, composition, and physical properties of crude oils; composition of natural gases. Primary, Secondary, and Tertiary Migrations; physico-chemical aspects of migration of petroleum; effects of temperature (geothermal gradients, thermal conductivities of subsurface rocks) and pressure (types and causes of subsurface pressures) on primary and secondary migration.	**35**	**18**
4	**Petroleum Traps and Petroliferous Basins of India** Traps and their associations. Cap rock and seal formation: lithological aspects and capillary characteristics of seals; diagenetic seals. Trap formation: structural – fold (anticlinal) traps, fault (sealing/non-sealing) traps; growth faults; traps associated with salt domes; stratigraphic – channel sand, up-dip wedges, sand lenses, sand bars; carbonate traps, etc. Classification of sedimentary basins of India. Structures, petroleum geology of petroleum producing basins of India.	**20**	**8**
	Total	**100**	**45**

i) Text Book and Reference Book:

- Introduction to Sedimentology (TextBook)

By S.M.Sengupta

- Sedimentary Rocks (TextBook)
  By F. J. Pettijohn,
- Principles of Sedimentology and Stratigraphy (TextBook)
  By Sam Boggs Jr.

j) List of Practicals

List of Practical	
1.	**Study of Crystal** Clinographic projection of cube
2.	**Study of common silicates in Hand Specimens** Quartz, Feldspar, Mica, Garnet, kyanite, Sillimanite
3.	**Study of Other Minerals in Hand Specimen** Graphite, Gypsum, Barite, Calcite, Aragonite, Corundum, haematite
4.	**Study of common Igneous Rocks in Hand Specimens** Granite, Basalt, Rhyolite, Syenite, Dolerite, Gabbro
5.	**Study of common Metamorphic Rock in Hand Specimen** Slate, Phyllite, Schist (Mica, Talc, Chlorite), Gneiss, Marble, Quartzite
6.	**Study of common Sedimentary Rock in Hand Specimen** Shale, Siltstone, Sandstone, Conglomerate, Breccia, Limestone
7.	**Study of Thin Sections of Minerals** Quartz, feldspar, mica, pyroxene) & Rocks (Granite, Basalt, Gabbro, Schist, Shale, Sandstone, Limestone
8.	**Study of Fossils** Study of Selected Fossils in Hand Specimen
9.	**Study of Maps** Study of Topographic & Geological Maps

2)

a) Course Name: Differential Equations and Vector Calculus

b) Course Code: 03019102BS02

c) Prerequisite: : Differential Calculus, Integral Calculus, Vector Algebra, Differential Equations

d) Rationale: This syllabus builds essential mathematical tools for engineering applications, covering differential equations, Laplace transforms, and vector calculus.

e) Course Learning Objective:

CLOBJ 1	Solve higher-order linear differential equations using standard methods for homogeneous and non-homogeneous cases.

CLOBJ 2	Apply differential equations to physical problems such as free, damped, and forced oscillations and RLC circuits.
CLOBJ 3	Use Laplace transforms and their properties to solve initial value problems efficiently.
CLOBJ 4	Expand functions using Fourier series, including half-range expansions for even and odd functions.
CLOBJ 5	Apply vector calculus concepts like gradient, divergence, curl, and line integrals in solving practical problems.

f) Course Learning Outcome

CLO 1	Solve Second and Higher-Order Ordinary Differential Equations
CLO 2	Apply Laplace Transform to Solve Differential Equations.
CLO 3	Apply Fourier series techniques to approximate periodic functions in mathematical and engineering contexts.
CLO 4	Compute and interpret vector differentiation concepts.

g) Teaching and Examination Scheme

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	-	4	40	20	-	-	60	100

h) Course Content

Course Content

Sr.	Topics	W	T
1	**Second and Higher-Order Ordinary Differential Equations** Homogeneous Linear ODE, Homogeneous constant coefficient linear ODE, non-homogeneous linear constant coefficient linear ODE, Undetermined coefficient and Variation of Parameter, Applications of higher order linear differential equations in Free oscillations, forced oscillations, Damped oscillations, RLC circuit	25	15
2	**Laplace Transformations and Its Applications:** Definition and Laplace transformation of elementary functions, Properties of Laplace Transformations - linearity property, First-Shifting Theorem, Derivative of Laplace transformation, Integration of Laplace transformation, Laplace transformation of Integral, Laplace transformation of derivatives, Inverse Laplace Transformation, Convolution theorem and Application of Laplace Transformation to solve ODE.	30	18
3	**Fourier Series** Fourier Series of periodic functions with arbitrary period, Even and Odd functions, Half-Range Fourier Series	15	9

4	**Vector Calculus: Vector Differentiation:** Vector-valued functions, smooth curve, vector differentiation, scaler-valued function, Gradiant of scaler valued function, Divergence and curl of vector-valued functions, Laplacian operator, Scalar potential function, **Vector Integration:** Line integral of scaler functions, Line integral of vector valued function, conservative vector field and independent of path, Green's theorem.	**30**	**18**
	Total	**100**	**60**

i) Text Book and Reference Book:

- Advanced Engineering Mathematics (TextBook) By Erwin Kreyszig | Willey India Education
- D.A. Murray, Introductory Course in Differential Equations. Orient Longman (India).
- Fourier Series and Boundary Value Problems, By James Brown and Ruel Churchill, | McGraw Hill
- Elementary Differential Equations and Boundary Value Problems, By William E Boyce and Richard C. D'Prima | Willey India Edition
- Advanced Engineering Mathematics, By K. A. Stroud and Dexter Booth, | Macmillan Publication

3)

a) Course Name: Principles of Management

b) Course Code: 06M10202UE01

c) Prerequisite: : Basic understanding of organizational structure and general awareness of business operations.

d) Rationale: This course lays the foundational framework for understanding managerial roles and functions in contemporary business settings..

e) Course Learning Objective:

CLOBJ 1	Understand fundamental management concepts and functions, including planning, forecasting, and the evolution of management thought in a business environment.
CLOBJ 2	Apply managerial processes and techniques, such as decision-making, organizing, staffing, directing, coordination, and management by objectives in organizational settings.
CLOBJ 3	Analyze leadership, communication, and organizational development strategies, including career development, change management, and challenges faced by contemporary businesses.

f) Course Learning Outcome

CLO 1	To describe the core principles of management, analyze historical developments, and apply planning techniques considering environmental factors.
CLO 2	To evaluate various management styles, design effective organizational structures, and apply decision-making and staffing techniques in managerial contexts.
CLO 3	To demonstrate effective leadership and communication strategies, manage organizational change, and critically assess modern-day managerial

	challenges

g) Teaching and Examination Scheme

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Course Content

Sr.	Topics	W	T
1	**Module 1:**Introduction to Management; Evolution of Management Thought; Planning; Understanding environment of business; Forecasting and Premising.	40	18
2	**Module 2** Decision-making; Management by Objectives and Styles of Management; Organizing and Directing; Staffing and Coordination.	20	9
3	**Module 3** Career Development Strategy; Leadership styles of Managers; Organizational Communication; Change management; Challenges of Contemporary Business	40	18
Total		100	45

4)

a) Course Name: Intellectual Property

b) Course Code: 06M10502UE03

c) Prerequisite: : A basic understanding of business, innovation, or creativity-related fields will be helpful.

d) Rationale: The course aims to empower future managers, entrepreneurs, and innovators to make informed IP-related decisions..

e) Course Learning Objective:

CLOBJ 1	Understand the fundamentals of Intellectual Property (IP), including patents, trademarks, and copyright, and their role in the intangible economy.
CLOBJ 2	Analyze the scope, enforcement, and commercial value of IP, including unconventional IP forms and strategies for using IP as a business asset.
CLOBJ 3	Evaluate the role of IP in research, creativity, and policy-making, including its significance in universities, creative industries, and government initiatives for promoting innovation.

f) Course Learning Outcome

CLO 1	To identify different forms of IP, understand their role in value creation, and analyze real-world examples of patents, trademarks, and copyrights.
CLO 2	To evaluate unconventional IPs, assess enforcement mechanisms, and apply business strategies to monetize intellectual assets.
CLO 3	To analyze the role of IP in research institutions and creative industries and assess the importance of policy and education in strengthening the IP framework.

g) Teaching and Examination Scheme

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	-	3	40	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Sr. No.	Content	Weightage	Teaching Hours
1	**Module 1** Basics of Intellectual Property; The Intangible Economy; Patents—From ball pens to biologics; Trade Marks—What does red soles and barbie girl mean?; Copyright—Is it right to copy?	40	18
2	**Module 2** Unconventional IP—The expanding scope; Enforcement of IP— Protecting your rights; IP for Business—A profit making asset class .	40	18
3	**Module 3** IP, Research, and Universities; IP for the Creative and Entertainment Industries; Governments Role in Fostering IP; Teaching IP—Let everyone learn IP	20	9

5)

a) Course Name: Design, Technology and Innovation

b) Course Code: 03M10002UE02

c) Prerequisite: : Zeal to learn the subject.

d) Rationale: Design, Technology, and Innovation (DT&I) subject's lies in equipping students with the skills to be creative problem solvers and innovators in a rapidly

evolving world. These subjects foster critical thinking, creative exploration, and the ability to translate ideas into tangible solutions, preparing students for future careers and societal challenges

e) Course Learning Objective:

CLOBJ 1	Understand and apply design thinking methodologies, including user-centered design, problem definition, concept generation, and evaluation techniques for developing effective solutions.
CLOBJ 2	Analyze the role of technology in design and innovation, including tools such as CAD, 3D printing, and emerging technologies (AI, IoT, AR/VR), along with engineering, safety, and sustainability considerations.
CLOBJ 3	Evaluate innovation and entrepreneurship processes, including intellectual property, business model development, and collaborative approaches to transform ideas into viable products or services.

f) Course Learning Outcome

CLO 1	Apply design thinking methodologies to identify and solve user-centered problems
CLO 2	Demonstrate creative thinking and effective ideation strategies.
CLO 3	Develop low-fidelity and high-fidelity prototypes and understand fabrication challenges.
CLO 4	Incorporate engineering principles into design and innovation.
CLO 5	Communicate ideas visually through sketching and graphical tools
CLO 6	Understand the fundamentals of entrepreneurship and the startup process

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**40**	**20**	**0**	**60**	**00**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Unit No.	**Topic**	**W**	**T**

1.	**Design Thinking and Methodologies** Introduction to Design Thinking:Understanding the design process, user needs, and problem definition. Design Process:Exploring different design methodologies, including brainstorming, sketching, and prototyping. Human and Culture Centered Design:Focusing on user needs, ergonomics, and user experience. Design for Social and Life style change. Concept Generation and Evaluation:Developing and evaluating design concepts through various techniques.	30	12
2.	**Technology and its Role in Design Technology for Design:** Exploring how technology enables and enhances the design process. Specific Technologies: Relevant areas like CAD and Graphics software, 3D printing, Machining technologies, digital fabrication, and other relevant technology. Innovation in Emerging Technologies and methods like AR/VR, IOT, AI and ML, Supply Chain Management and Project Management. Technology to Solution: Understanding how technology can be leveraged to solve real-world problems. Engineering Aspect of design Electrical, Mechanical, Design, Material, Aspect, Safety and Reliability aspect, Sustainable and Eco friendly materials**.**	35	16
3.	**Innovation and Entrepreneurship** Introduction to Innovation: Understanding the principles of innovation and its role in product development. Role of Innovation in Life and Society Grassroots Innovation: Learning from innovative solutions developed at the community level. Collaborative Innovation: Exploring how different individuals and teams can collaborate to drive innovation. Intellectual Property: Learning about patents, copyrights, and other forms of intellectual property. Business Model Development: Exploring how to develop a business model for a new product or service. Entrepreneurship: Fundamentals of starting a business and the challenges and opportunities of entrepreneurship	35	16

7)

a) **Course Name:** Indian Economy: Some Contemporary Perspectives

b) **Course Code:** 06M10102UE02

c) **Prerequisite:**Basic understanding of economic principles and macroeconomic concepts is recommended. Familiarity with the Indian economic structure and current affairs will be beneficial but is not mandatory

d) Rationale: This course is designed to provide students with a comprehensive understanding of the Indian economy's evolution, key reforms, and current challenges.

e) Course Learning Objective:

CLOBJ 1	Analyze the evolution of the Indian economy since independence, with emphasis on pre- and post-reform phases, including agricultural and industrial reforms in a mixed economy framework.
CLOBJ 2	Evaluate key socio-economic, tax, and financial sector reforms, including financial inclusion initiatives and challenges in the Indian banking system.
CLOBJ 3	Assess India's integration with the global economy, focusing on WTO regulations, structural shocks, recent policy measures, and current economic challenges.

f) Course Learning Outcome

CLO 1	To critically assess the trajectory of India's economic development since independence and explain the impact of major sectoral reforms in agriculture and industry.
CLO 2	To evaluate the effectiveness of financial sector reforms, tax policies, and India's engagement with WTO regulations in promoting inclusive and sustainable economic growth.
CLO 3	To analyze the impact of recent policy shocks and government initiatives on the Indian economy and identify key challenges to future economic stability and growth.

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	0	0	3	40	20	0	60	0	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Unit No.	**Topic**	**Weightage**	**Teaching Hrs.**
1.	**Module** 1 Indian economy since independence; analysis of the pre- and post-reform periods of India's economic growth and development; Assessment of agriculture sector reforms; industrial reforms in a mixed economic set up and tracing the contours of liberalization and self-reliance.	40	18

2.	**Module 2** Socio-economic development and tax reforms; Financial sector reforms and financial inclusion; Indian banking sector crisis and recent developments	40	18
3.	**Module 3** India and WTO regulations: Inward and outward analysis; Structural shocks and analysis of recent policy initiatives; Indian economy: Recent outlook and challenges.	20	9

8)

a) **Course Name:** Privacy and Security in Online Social Media

b) **Course Code:** 03M10002UE01

c) **Prerequisite:** : Basic knowledge of social media, privacy and security.

d) **Rationale:** The course explores the fundamentals of Online Social Networks (OSNs), focusing on data collection, analysis, trust, security, and privacy.

e) **Course Learning Objective:**

CLOBJ 1	Understand the fundamentals and evolution of Online Social Networks (OSNs), including their structure, data generation processes, and the role of social media APIs in data extraction.
CLOBJ 2	Apply data collection and analysis techniques to extract, preprocess, and interpret social media data while addressing ethical considerations in real-world scenarios.
CLOBJ 3	Evaluate trust, credibility, and reputation mechanisms in online communities and analyze methods for detecting misinformation, fake news, and improving trustworthiness.
CLOBJ 4	Analyze security and privacy challenges in OSNs, including phishing attacks, data disclosure risks, and techniques for identifying fraudulent entities and fake profiles.
CLOBJ 5	Assess real-world applications and emerging trends in OSNs, including case study analysis, research evaluation, and the role of social networks in law enforcement and future security developments.

f) **Course Learning Outcome**

CLO 1	Understand Online Social Networks and Data Collection – Explain the fundamentals of online social networks, data collection methods, and the challenges and opportunities associated with them.
CLO 2	Analyze Trust, Credibility, and Reputation in Social Systems – Evaluate the role of trust and reputation in online communities and develop strategies to detect misinformation and enhance credibility.
CLO 3	Examine Privacy and Security Risks in OSNs – Assess the impact of privacy disclosure, phishing, and fraudulent activities in social media and propose Counter measures.

CLO 4	Apply Data Collection and Analysis Techniques – Utilize social media APIs and data processing methods to extract, clean, and analyze information from online social networks.
CLO 5	Conduct Research on Emerging OSN Topics – Engage in discussions and research on social media security, privacy, and law enforcement applications, contributing to the field through case studies and research papers

g) Teaching and Examination Scheme

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	40	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction to Online Social Networks Definition and Evolution of Online Social Networks (OSNs), Data Collection from Social Networks, Challenges, Opportunities, and Pitfalls in OSNs, social media APIs for Data Extraction.	20	8
2	Data Collection and Analysis in OSNs Techniques for Collecting Data from Online social media, Ethical Considerations in Social Media Data Collection, Data Processing and Cleaning for Analysis, Case Studies on Social Media Data Collection	20	8
3	Trust, Credibility, and Reputation in Social Systems Understanding Trust and Credibility in Online Communities, Reputation Systems and Their Impact on User Behavior, Detecting Misinformation and Fake News in OSNs, Methods for Enhancing Trustworthiness in Social Media	20	8
4	Security, Privacy, and Fraud Detection in OSNs Online Social Media and Its Role in Law Enforcement & Policing, Information Privacy: Disclosure, Revelation, and Its Effects, Phishing Attacks in OSNs and Their Countermeasures, Identifying Fraudulent Entities and Fake Profiles in OSNs.	20	8
5	Research and Practical Applications Review and Discussion of Key Topics (Refresher), Analyzing Real-World OSN Case Studies, Research Paper Discussions on Online Social Networks and Security, Future Trends in OSN Security and	20	8

	privacy		

i) Text Book and Reference Book:

- "Social Media Mining: An Introduction" – Reza Zafarani, Mohammad Ali Abbasi, Huan Liu: Provides a comprehensive introduction to social media data mining, including machine learning and network analysis techniques.
- Mining the Social Web" – Matthew A. Russell: Covers data collection, analysis, and visualization techniques using Python and APIs from platforms like Twitter, Facebook, and LinkedIn.

9)

a) Course Name: Environmental Science

b) Course Code: 03010002MC01

c) **Prerequisite:** : Knowledge of Mathematics up to 12th science level

d) Rationale: The proposed syllabus of Environmental Science is comprehensive and multidisciplinary, reflecting the interconnectedness of ecological systems, technological development, human behavior, and urban planning. This rationale explains the relevance and importance of each thematic area covered: Environmental Health, Ecology, and Quality of Life; Pollution Prevention; Population Growth and Global Environmental Challenges; Environmental Information Systems and Technological Tools; Smart Cities

e) Course Learning Objective:

CLOBJ 1	Apply systems thinking to analyse the city as a system, demonstrating application
CLOBJ 2	Evaluate the role of smart citizens and approaches for citizen engagement
CLOBJ 3	Identify sources and stressors of water resources, demonstrating understanding
CLOBJ 4	Analyse the causes, effects, and control measures of population explosion

f) Course Learning Outcome

CLO 1	Analyze the impact of human activities on environmental sustainability and ecosystems.
CLO 2	Promote awareness about biodiversity conservation and its importance for ecological balance.
CLO 3	Assess the effects of pollution and propose strategies for pollution control and waste management.
CLO 4	Describe the significance of climate change and its global implications on

	ecosystems and human life.

g) Teaching and Examination Scheme

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	-	0	50	50	-	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h) Course Content

Sr.	Topics	W	T
1	FUNDAMENTALS OF ENVIRONMENTAL SCIENCE Definition, Principles and Scope of Environmental Science. Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Laws of thermodynamics, heat transfer processes, mass and energy transfer across various interfaces, material balance. Meteorological parameters - pressure, temperature, precipitation, humidity, radiation and wind velocity. Interaction between Earth, Man and Environment. Biogeographic provinces of the world and agro-climatic zones of India. Concept of sustainable development goals. Environmental education and awareness. Environmental ethics	15	3
2	ENVIRONMENTAL POLLUTION AND CONTROL Air, Noise, Water, Soil, Thermal, Marine, and Radioactive pollution, focusing on sources, types of pollutants, and their impacts on human health, plants, and materials. It includes the measurement techniques and standards for air and water quality, along with pollution control devices and methods. Key topics include criteria air pollutants, noise indices, wastewater treatment, and soil pollution management.	25	4
3	ENVIRONMENT MANAGEMENT AND LEGISLATION Overview of Environmental Laws in India: Constitutional provisions in India (Article 48A and 51A), Forest Conservation Act, 1980, Water (Prevention and Control of Pollution) Act, 1974 amended 1988 and Rules 1975, Air (Prevention and Control of Pollution) Act, 1981 amended 1987 and Rules 1982, Environmental (Protection) Act, 1986 and Rules 1986, The Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016, The Solid Waste Management Rules, 2016, , Noise Pollution (Regulation 8 and Control) Rules, 2000, Environmental Conventions and Agreements: Stockholm Conference on Human Environment 1972,	25	3

	Montreal Protocol, 1987, Basel Convention (1989, 1992), Earth Summit at Rio de Janeiro, 1992, Agenda-21, Global Environmental Facility (GEF), Convention on Biodiversity (1992), UNFCCC, Kyoto Protocol, 1997, Clean Development Mechanism (CDM), Copenhagen Summit, 2009.		
4	CONTEMPORARY ENVIRONMENTAL ISSUES Current Environmental Issues in India: Environmental issues related to water resource projects - Narmada dam, Tehri dam etc., Hydro-power projects in Jammu & Kashmir etc.. Water conservation-development of watersheds, Rain water harvesting and ground water recharge. National river conservation plan – Namami Gange and Yamuna Action Plan. Eutrophication and restoration of lakes. Conservation of wetlands, Ramsar sites in India. Climate change - adaptability, energy security, food security and sustainability. Wild life conservation projects: Project tiger, Project Elephant etc., Carbon sequestration and carbon credits. Waste Management – Swachha Bharat Abhiyan. Sustainable Habitat: Green Building, GRIHA Rating Norms. Vehicular emission norms in India. Epidemiological Issues: Fluorosis, Arsenocosis, Goitre, Dengue. Environmental Disasters: Minnamata Disaster, Love Canal Disaster, Bhopal Gas Disaster, 1984	15	3
5	CLIMATE RESILIENT CITY Introduction to Climate Resilience – Understanding the need for cities to adapt to climate change. Impact of Climate Change on Cities – Urban heat islands, flooding, pollution, and infrastructure challenges. Sustainable Urban Planning – Role of green spaces, energy-efficient buildings, and smart city concepts. Green Infrastructure – Importance of urban forests, permeable surfaces, and nature-based solutions. Case Studies and Future Trends – Learning from cities like Singapore, Rotterdam, and Copenhagen	20	2

i) Text Book and Reference Book:

- Textbook of Environmental Studies for Undergraduate Courses' (TextBook) By Erach Bharucha | Universities press
- Basics of Environmental Studies By U K Khare | Tata McGraw Hi
- Environmental Studies (TextBook) By Anindita Basak | Drling Kindersley(India)Pvt. Ltd Pearson
- Environmental Sciences By Daniel B Botkin & Edward A Keller | John Wiley & Sons
- Air Pollution By M. N. Rao and H. V. N. Rao; | Tata McGraw-Hill Publishing Company

- Environmental Engineering By Howard S. Peavy, Donald R. Rowe, George Tchobanoglous
  | McGraw-Hill

10)

a) Course Name: Advanced Communication and Interpersonal Skills

b) Course Code: 03010002HM01

c) Prerequisite: : Basic Communication Skills are essential for all Engineers

d) Rationale: Strengthen core language and soft skills through applied grammar, communication tasks, and vocabulary building.

e) Course Learning Objective:

CLOBJ 1	Apply core grammatical principles including subject–verb agreement, reported speech, and active–passive voice to improve accuracy in spoken and written communication.
CLOBJ 2	Expand functional vocabulary and language usage by applying synonyms, antonyms, homonyms, idioms, and contextual word meanings effectively.
CLOBJ 3	Develop effective reading comprehension skills to understand, interpret, and respond to intermediate-level texts and spoken content.
CLOBJ 4	Enhance written and spoken expression through structured essay writing, Paragraph development, confident self-introduction, and professional grooming practices.
CLOBJ 5	Develop self-management and personal development skills by applying SWOT analysis, practicing effective time management strategies, and engaging in reflective learning processes.

f) Course Learning Outcome

CLO 1	Remember rules of subject–verb agreement, reported speech, and active–passive voice to produce grammatically correct sentences in real-life contexts.
CLO 2	Understand the usage of appropriate vocabulary including synonyms, antonyms, homonyms, homophones, homographs, and idioms in spoken and written communication.
CLO 3	Apply structured essays, Paragraph, and confident self-introductions using appropriate language, logical organization, professional etiquette, and positive body language.
CLO 4	Analyse intermediate-level reading passages by identifying main ideas, supporting details, tone, and purpose.
CLO 5	Evaluate SWOT analysis and time-management techniques to plan personal goals, prioritize tasks, and improve academic and professional effectiveness.

g) Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**		
				Internal Evaluation	**ESE**	

L	T	P	C	MSE	CE	P	Theory	P	Total
1	-	2	2	40	0	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

h) Course Content

Sr. No.	Content	Weightage	Teaching Hours
1	Subject Verb Agreement Rules of subject- verb matching Singular vs plural forms Common agreement errors	10	1
2	Reported Speech Direct and indirect speech Changing tenses, pronouns, and time expressions Reporting statements, questions, and commands	10	1
3	Active and Passive Voice Difference between Active and Passive Rules for converting sen tences Usage in real-life contexts	10	1
4	Building Vocabulary Word meanings and usage Synonyms and antonyms Homonyms, Homophones, Homographs, Idioms	10	2
5	Grooming and Personality Development Importance of dressing and professional etiquette Building confidence and positive body language	10	2
6	SWOT Analysis with Self Introduction Identifying strengths, weaknesses, opportunities, threats Preparin g and delivering a confident self-introduction Developing self- awareness and a growth mindset	10	2
7	Reading Comprehension (Intermediate Level) Understanding written texts Finding main ideas and supporting details Answering questions accurately	10	2
8	Listening Comprehension (Intermediate Level) Listening for specific information Identifying tone and purpose Responding appropriately	10	1
9	Essay Writing Structure of an essay: introduction, body, conclusion Organizing ideas logically Using appropriate language and tone	10	2
10	Time Management Importance of managing time Prioritization Creating	10	1

	schedules		

i) Text Book and Reference Book:

- Technical Communication: Principles And Practice
  By Sangeetha Sharma, Meenakshi Raman | Oxford University Press | 2nd Edition
- Personality Development and Soft Skills
  By Barun K Mitra | Oxford, 2011
- High School English Grammar and Composition
  By Wren & Martin | S. Chand Publishing, Pub. Year 2017
- English Grammar in Use
  By Raymond Murphy | Cambridge University Press, Pub. Year 2019
- Communication Skills and Soft Skills
  By Suresh Kumar | Pearson Publication, 2010

j) List of Practicals

Sr.	Content	Weightage	Teaching Hrs.
1	**a.** Subject Verb Agreement **b.** Fill-in-the-blank exercises **c.** Sentence correction tasks **d.** Group quiz competition **e.** Role-play using correct subject- verb forms	10%	2
2	• Reported Speech • Dialogue conversion practice • Pair work: narrate a conversation • Reporting classroom news • Role-play followed by reporting	10%	2
3	Active and Passive Voice • Transform active sentences to passive and vice versa • Rewrite instructions in passive voice • Classroom narration using passive structures • Group activity: change story voice	10%	2
4	Building Vocabulary • Daily word journal • Vocabulary flashcards and games • Synonym-antonym match-up • Word building through storytelling	10%	4

5	Grooming and Personality Development **a.** Personal grooming checklist task **b.** Group discussion on personality traits **c.** Mock social interaction **d.** Confidence-building exercises	10%	4
6	SWOT Analysis with Self Introduction ● SWOT worksheet filling ● Self-introduction in pairs or groups ● Strength-sharing circle ● Feedback on introductions	10%	4
7	Reading Comprehension (Level of Difficulty – Intermediate) ● Reading passage followed by Q&A ● Find-the-theme activity ● Vocabulary hunt from the passage ● Summarizing a short text	10%	4