ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2008

B.TECH. PETROLEUM ENGINEERING

II - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER II
(Common to all B.E. / B.Tech. Degree Programmes except B.E. – Marine Engineering)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS2161	Technical English – II*	3	1	0	4
2.	MA2161	Mathematics – II*	3	1	0	4
3.	PH2161	Engineering Physics – II*	3	0	0	3
4.	CY2161	Engineering Chemistry – II*	3	0	0	3
5. a	ME2151	Engineering Mechanics **(For non-circuit branches)**	3	1	0	4
5. b	EE2151	Circuit Theory **(For branches under Electrical Faculty)**	3	1	0	4
5. c	EC2151	Electric Circuits and Electron Devices **(For branches under I & C Faculty)**	3	1	0	4
6. a	GE2151	Basic Electrical & Electronics Engineering **(For non-circuit branches)**	4	0	0	4
6. b	GE2152	Basic Civil & Mechanical Engineering **(For circuit branches)**	4	0	0	4
PRACTICALS						
7.	GE2155	Computer Practice Laboratory-II*	0	1	2	2
8.	GS2165	Physics & Chemistry Laboratory - II*	0	0	3	2
9. a	ME2155	Computer Aided Drafting and Modeling Laboratory **(For non-circuits branches)**	0	1	2	2
9. b	EE2155	Electrical Circuits Laboratory **(For branches under Electrical Faculty)**	0	0	3	2
9. c	EC2155	Circuits and Devices Laboratory **(For branches under I & C Faculty)**	0	0	3	2
						TOTAL : 28 CREDITS
10.	-	English Language Laboratory[+]	0	0	2	-

A. CIRCUIT BRANCHES

I Faculty of Electrical Engineering

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II Faculty of Information and Communication Engineering

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. NON – CIRCUIT BRANCHES

I Faculty of Civil Engineering

1. B.E. Civil Engineering

II Faculty of Mechanical Engineering

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

SEMESTER-III

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA 2211	Transforms and Partial Differential Equations	3	1	0	4
PE 2201	Process Engineering Calculations	3	1	0	4
PE 2202	Geophysics-I	3	0	0	3
PE 2203	Fluid Mechanics	3	0	0	3
PE 2204	Heat and Mass Transfer	3	0	0	3
PE 2205	Introduction to Petroleum Engineering	3	0	0	3
PRACTICALS					
PE 2207	Fluid Mechanics Laboratory	0	0	3	2
PE 2208	Heat and Mass Transfer Laboratory -I	0	0	3	2
	TOTAL	**18**	**2**	**6**	**24**

SEMESTER- IV

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA 2263	Probability and Statistics	3	1	0	4
PE 2251	Petroleum Refinery and Petrochemicals	3	0	0	3
PE 2252	Reservoir Rocks and Fluid Properties	3	0	0	3
PE 2253	Fundamentals of Petroleum Geology	3	0	0	3
PE 2254	Geophysics -II	3	0	0	3
PE 2255	Reservoir Engineering -I	3	0	0	3
PRACTICALS					
PE 2257	Petroleum Testing Laboratory	0	0	3	2
PE 2258	Heat and Mass Transfer Laboratory-II	0	0	3	2
	TOTAL	**18**	**1**	**6**	**23**

SEMESTER-V

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
PE 2301	Well Drilling Equipments and Operations	3	0	0	3
PE 2302	Well Logging	3	0	0	3
PE 2303	Drilling Fluids and Cementing Techniques	3	0	0	3
PE 2304	Field Development Geology	3	0	0	3
PE 2305	Reservoir Engineering -II	3	0	0	3
PE 2306	Water Flooding and Enhanced Oil Recovery	3	0	0	3
PRACTICALS					
GE 2321	Communication Skills Laboratory	0	0	4	2
PE 2307	Drilling Fluids and Cementing Techniques Lab	0	0	3	2
PE 2308	Geology Laboratory	0	0	3	2
	TOTAL	**18**	**0**	**10**	**24**

SEMESTER-VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
PE 2351	Reservoir Characterization and Modeling	3	0	0	3
PE 2352	Petroleum Production Engineering	3	0	0	3
PE 2353	Well Completion Testing and Work over	3	0	0	3
GE 2021	Environmental Science and Engineering	3	0	0	3
PE 2355	Petroleum Economics	3	0	0	3
PE 2356	Natural Gas Engineering	3	0	0	3
PRACTICALS					
PE 2357	Petroleum Transportation Design	0	0	3	3
PE 2358	Process Control and Instrumentation Laboratory	0	0	3	3
	TOTAL	**18**	**0**	**6**	**24**

SEMESTER-VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
PE 2401	Onshore and Offshore Engineering and Technology	3	0	0	3
PE 2402	Integrated Oil/Gas Field Evaluation	3	0	0	3
PE 2403	Petroleum Equipment Design	3	0	0	3
PE 2404	Numerical Reservoir Simulation	3	0	0	3
	Elective -I	3	0	0	3
	Elective -II	3	0	0	3
PRACTICALS					
PE 2407	Oil Field Equipment Design Drawing	0	0	3	3
PE 2408	Petroleum Equipment Design Laboratory	0	0	3	3
	TOTAL	**18**	**0**	**6**	**24**

SEMESTER-VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
GE 2025	Professional Ethics In Engineering	3	0	0	3
GE 2022	Total Quality Management	3	0	0	3
E3	Elective -III	3	0	0	3
PRACTICAL					
PE 2451	Project Work	0	0	12	6
	TOTAL	**9**	**0**	**12**	**15**

LIST OF ELECTIVES

ELECTIVE I

CODE NO.	COURSE TITLE	L	T	P	C
PE 2021	Marketing Fundamentals	3	0	0	3
PE 2023	Refinery Engineering	3	0	0	3
PE 2024	Petroleum Transportation Engineering	3	0	0	3
PE 2025	Major Hazards Management	3	0	0	3
PE 2026	Petroleum Corrosion Technology	3	0	0	3

ELECTIVE II

CODE NO.	COURSE TITLE	L	T	P	C
PE 2030	Advanced Topics in Geophysics	3	0	0	3
PE 2032	Advanced Drilling Engineering	3	0	0	3
PE 2033	Well Completion and simulation	3	0	0	3
PE 2034	Risk Assessment and Safety Engineering	3	0	0	3

ELECTIVE III

CODE NO.	COURSE TITLE	L	T	P	C
PE 2035	Storage and Transportation of Crude Oil and Natural Gas	3	0	0	3
PE 2036	Computer - Aided Process Plant Design	3	0	0	3
PE 2037	Bio-Chemical Engineering	3	0	0	3
PE 2038	Chemical Kinetics and Reactor Design	3	0	0	3
PE 2039	Principles of Geochemistry	3	0	0	3

HS2161 **TECHNICAL ENGLISH II** **L T P C**
3 1 0 4

AIM

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I **12**

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II **12**

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III **12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV **12**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V **9**

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL: 60 PERIODS

TEXT BOOK

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161 MATHEMATICS – II L T P C
3 1 0 4

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES

1. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161 ENGINEERING PHYSICS – II L T P C
3 0 0 3

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007)
2. Charles P. Poole and Frank J.Owen, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

REFERENCES

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

CY2161 ENGINEERING CHEMISTRY – II L T P C
3 0 0 3

AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^{+} vs Cl^{-} titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

REFERENCES

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

ME2151 ENGINEERING MECHANICS L T P C
3 1 0 4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.

Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL : 60 PERIODS

TEXT BOOK

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES

1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

EE2151 CIRCUIT THEORY L T P C

(Common to EEE, EIE and ICE Branches) **3 1 0 4**

UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL : 60 PERIODS

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).

REFERENCES

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

EC2151	ELECTRIC CIRCUITS AND ELECTRON DEVICES	L T P C
	(For ECE, CSE, IT and Biomedical Engg. Branches)	3 1 0 4

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C

(Common to branches under Civil, Mechanical and Technology faculty) **4 0 0 4**

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL : 60 PERIODS

TEXT BOOKS

1. V.N. Mittle “Basic Electrical Engineering”,Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, “Applied Electronics” S. Chand & Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”,Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Mehta V K, “Principles of Electronics”, S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, (2002).
5. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers, (2003).

GE2152	BASIC CIVIL & MECHANICAL ENGINEERING	L	T	P	C
	(Common to branches under Electrical and I & C Faculty)	4	0	0	4

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV I C ENGINES 10

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL : 30 PERIODS

REFERENCES

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering",Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

GE2155 COMPUTER PRACTICE LABORATORY – II L T P C
0 1 2 2

LIST OF EXPERIMENTS

1. UNIX COMMANDS 15

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING 15

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX 15

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

GS2165 **PHYSICS LABORATORY – II** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.

GS2165 **CHEMISTRY LABORATORY – II** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.

ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C
0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.

2. Drawing of a Title Block with necessary text and projection symbol.

3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.

4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.

5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).

6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)

7. Drawing of a simple steel truss.

8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,

9. Drawing isometric projection of simple objects.

10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL: 45 PERIODS

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

EE2155	ELECTRICAL CIRCUIT LABORATORY (Common to EEE, EIE and ICE)	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155	CIRCUITS AND DEVICES LABORATORY	L T P C 0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.

5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

TOTAL: 45 PERIODS

ENGLISH LANGUAGE LABORATORY (Optional)

L	T	P	C
0	0	2	-

1. Listening: **5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: **5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session **20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures.
   Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation

(1) Lab Session – 40 marks

Listening – 10 marks
Speaking – 10 marks
Reading – 10 marks
Writing – 10 marks

(2) Classroom Session – 60 marks

Role play activities giving real life context – 30 marks
Presentation – 30 marks

Note on Evaluation

1. Examples for role play situations:

a. Marketing engineer convincing a customer to buy his product.

b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.

2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

(Common to all branches of B.E. / B.Tech Programmes)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS 9 + 3

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9 +3

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL: 60 PERIODS

TEXT BOOK

1. Grewal, B.S, "Higher Engineering Mathematic", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

PE 2201 PROCESS ENGINEERING CALCULATIONS L T P C
3 1 0 4

AIM

Every Chemical creation involves consumption of materials and energy. The reactions are to be balanced with correct quantity of materials and energy to achieve good percentage of conversion for products. The aim of course is to give fundamental knowledge on such material and energy balances.

OBJECTIVES

To make students understand different types of laws of Chemistry of materials and also prepare the students to accurately calculate the stoichiometric relations between the materials involved in a physical and chemical reaction.

UNIT I **12**

Methods of expressing compositions of mixture and solutions, wet and dry basis conept.
Ideal and real gas laws – Gas constant – normal molal volume, calculations of pressure, volume and temperature using ideal gas law. Gas mixtures – Use of partial pressure and pure component volume in gas calculations – Dissociating gases – applications of real gas relationships in gas calculation.
Gas Reservoir calculation of gas in place by volumetric method. Calculation of unit recovery from volumetric gas reservoirs. Calculation of unit recovery from Gas Reservoir under water drive.

UNIT II **12**

Concept of material balance : Application of material balance to unit operations like distillation, evaporation, drying. Material balance involving key components, material balance with chemical reaction, - Limiting and excess reactants – Degree of completion. Application of material balance to various types of chemical reactions – recycle and by passing operations – concept of purge.
Material balance equations for dry gas reservoirs. Material balance for solution – gas drive reservoirs.

UNIT III **12**

Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity – Dew point – Use of humidity in condensation and drying – Wet and dry bulb temperatures, Humidity chart, solving problems using humidity chart.

Calculation of orsat analysis of products of combustion of solid, liquid and gas fuels – Calculation of hydrogen to carbon ratio and percentage excess air from flue gas analysis, calculations of sulphur and sulphur compounds burning operations.

UNIT IV **12**

Heat capacity of solids, liquids, gases – mean heat capacity – calculation of sensible heat using heat capacity, Kopp's rule, various types of latent heats.

Energy balances – enthalpy data including steam tables and psychrometric charts, heat capacity data, phase change, mixing, heat of solutions, enthalpy – concentration diagram, heats of formation. Combustion and reaction.

UNIT V **12**

Integrated material and energy balance equation. Concept of unsteady state material and energy balances, problems on unsteady state material and energy balances. Calculations of material balance of gas reservoir in different regions with variation in composition.

TOTAL: 60 PERIODS

TEXT BOOKS

1. Batt, B.L Vora, S.M. "Sloichiometry" 3rd Edition, Tata Mc.Graw – Hill (1996).
2. Himmelblau, D.M. "Basic Principles of Calculations in Chemical Engineering" EEE, Sixth Edition, Prentice Hall Inc. 2003.
3. Felder, R.M. and Rousseau, R.W "Elementary Principles of Chemical Processes", 3rd Edition, John Wiley & Sons, New York, 2000.

REFERENCES

1. Houghen O.A, Watson K.M. and Ragatz R.A, "Chemical Process Principles" Part I, CBS Publishers (1973).
2. Warren K.Lewis, Arthur.M, Radash & H.Clay Lewis, "Industrial Stoichiometry, Mc.Graw Hill Book Co., New York, 1995.
3. William C.Lyons, Gary J.Plisga "Standard Handbook of Petroleum and Natural Gas Engineering" Second Edition, Gulf publishing Co., New York 2005.

PE2202 **GEOPHYSICS I** **L T P C**
3 0 0 3

AIM

To impart knowledge on the Earth as a planet and its internal structure, geomagnetism, paleo-magnetism, geothermal and electrical properties.

OBJECTIVES

Students develop a sound knowledge on Seismology, Seismic survey techniques for oil and gas exploration.

UNIT I **9**

The earth as a planet and internal structure. Principles of measurements and measurement of earth. Position location techniques on earth's surface. Geodynamics. Plate tectonics, its mechanics and continental margins.

UNIT II **9**

Gravitational force and gravity measurement methods. Accuracy and correction of gravity date. Gravity anomalies and their interpretation. Magnetic field and paleomagnetism. Magnetic surveys, anomalies and interpretation.

UNIT III **9**

Heat generation, flow, Distribution and measurement. Geothermal exploration and temperature logging. Electrical properties of rocks. Electrical survey methods. Elecgtromagnetic methods.

UNIT IV **9**

Earthquakes, history, observation, nomenclature. Study of body and surface waves and prediction of earthquakes. Seismic waves reflection and refraction and their use in data acquisition. Geometry of Seismic waves, wave theory, diffractions and velocities. Tsunamis.

UNIT V **9**

Land operations. Marine methods. 3D exploration. Non-conventional methods – VSP, Shear waves, channel waves. Seismic data processing. Attribute analsis and Migration techniques.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Principles of applied geophysics by D.S.Parasnis
2. Geophysical methods by Robert E.Sherief

REFERENCE

1. The Blue Planet : An introduction to Earth System Science 2nd Edition by Brain J.Skinner

PE2203 **FLUID MECHANICS** **L T P C**
3 0 0 3

AIM

To have a general idea about the Mechanism of fluid, fluid flow, flow measuring devices through basic concepts and fluid dynamics in Porous Media.

OBJECTIVES

The subject will help the students to have knowledge on the fluid properties, their characteristics while static and during flow through ducts, pipes and porous medium. Knowledge on several machineries used to transport the fluid and their performance are assessed.

UNIT I **9**

The concept of fluid, the fluid as a continuum physical and thermodynamic properties – basic laws – Newtorian and non-newtorian fluids – flow patterns – Velocity field – streamlines and stream tubes – vorticity and irrotationality.

The principle of dimensional hormogeneity – dimensional analysis, the Pi-theorems. Similitude – use of dimensional analysis for scale up studies.

UNIT II **9**

Pressure and Pressure gradient – equilibrium of fluid element – hydrostatic pressure distributions – application to manometry – mass, energy and momentum balances – continuity equation, equation of motion, Navier – stokes equation and Bernoullis theorem.

UNIT III **9**

Reynold's number regimes, flow through pipes – head loss, friction factor, minor losses in pipe systems and multiple pipe systems – boundary layer concepts, drag forces on solid particles in fluids – flow through fixed and fluidized beds.

UNIT IV **9**

Constant and variable head meters – pipes, fittings and valves, classification of pumps – performance, curves – compressors and its efficiency. Introduction to compressible flow, comparison of adiabatic and isothermal flow of gases.

UNIT V **9**

Fluid dynamics in Porous Media – Hydrostatic pressure and geothermal gradients. Porosity – permeability relationships and rock microstructure. Diffusivity equation steady state, pseudo-steady state and transfer flow Radial flow and well models. Skin, partial penetration and well productivity index. Horizontal wells. Gas flow and Kbinkenberg effect.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Neol de Nevers, "Fluid Mechanics for Chemical Engineers." II Edition, Mc.Graw Hill (1991).
2. James O.Wilkes and Stacy G.Bikes, "Fluid Mechanics for Chemical Engineers" Prentice Hall PTR (International Series in Chemical Engineering) – (1999).
3. Mc.Cabe W.L.Smith, J.C and Harriot..P "Unit operations in Chemical Engineering", Mc.Graw Hill, V Edition, 2001.

REFERENCES

1. White F.M., "Fluid Mechanics", IV Edition, Mc.Graw – Hill Inc. 1999.
2. Darby, R. "Chemical Engineering Fluid Mechanics" Marcel Decker, 1998.

PE2204 **HEAT AND MASS TRANSFER** **L T P C**
3 0 0 3

AIM

To provide fundamental instruction in various methods of heat transfer through difference media. To impart knowledge on how certain substances undergo go the change in composition, change in phases and exhibit the properties according to the changed environment.

OBJECTIVES

Students gain knowledge in various heat transfer methodology in chemical process engineering. Also students develop a sound knowledge in Mass Transfer operation.

UNIT I **9**

Introduction to various modes and mechanisms of heat transfer. Fourier's law of heat conduction – one dimensional steady state heat conduction equation for flat plate, hollow cylinder, rate equations, Heat conduction through a series of resistances – Thermal conductivity measurement, effect of temperature on thermal conductivity. Difusional heat transfer based on shell balances approach for one-dimensional steady state and transient transfer with heat generation and chemical reactions. Composite walls, heat transfer in extended surfaces.

UNIT II **9**

Concepts of heat transfer by convection – Natural and forced convection, analogies between transfer of momentum and heat transfer. Reynold's analogy, prandtl and coulburn analogy. Dimensional analysis in heat transfer. Correlations for calculation of heat transfer co-efficients, heat transfer co-efficient for flow through a pipe.

Heat transfer to fluids with phase change – heat transfer from condensing vapours, dropwise and film wise condensation, Nusselt equation for vertical and horizontal tubes, effect of non-condensable gases on rate of condensation.

UNIT III **9**

Paraplel and Counterflow heat exchangers – Log mean temperature difference – single pass and multipass heat exchangers, plate heat exchangers. Fouling factors design of various types of heat exchangers.

UNIT IV **9**

Diffusion in fluids – Molecular and eddy diffusion measurement and calculation of diffusivities. Ordinary diffusion in multi component gaseous mixtures.

Mass Transfer co-efficients. Theories of mass transfer, concept of NTU & HTU. Analogies between momentum, heat and mass transfer. Equilibrium and operating lines. JD factor.

Liquid – Liquid Equilibrium – Extraction principles – Batch and continuous extractors – Design equation for extraction. Spray, packed and mechanically agitated contactors and their design calculations – packed bed extraction with reflux.

UNIT V **9**

Vapour liquid equilibria – Raoult's law, Vapor liquid equilibrium diagrams for ideal and non-ideal systems, enthalpy concentration diagrams. Principles of distillation, flash distillations, differential distillation, steam distillation, multistage continuous rectification, number of ideal stages by Mecabe – Thiele method panchan – Savarit method. Total reflex, minimum reflex ratio, optimum reflex ratio. Multicomponent distillation. Areotropic and extractive distillation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. W.L.Mecabe, J.C.Smith and P.Harriot, "Unit Operations of Chemical Engineering", 6th Edition, McGraw Hill Book Co., New York 2001.
2. R.E.Treybal "Mass Transfer Operations", 3rd Edition, Mc.Graw Hill Book Co., New York, 1985.
3. Kern D-Q "Process Heat Transfer"Mc.Graw Hill, 1999.

REFERENCES

1. J.H.Coulson and J.F.Richardson, "Chemical Engineering", Vol.I, II & III Butterworth, Hein – Mann publishers, New Delhi, 1999.
2. C.J.Gankopolis "Transport processes and unit operations" 3rd Edition, Prentice Hall of India, New Delhi, 1996.
3. Coulson J.M. and Richardson,J.F "Chemical Engineering" Vol.1, 4th Edition, Asian Books Pvt. Ltd., India, 1998.
4. Holman, J.P."Heat Transfer" 8th Edition, Mc.Graw Hill, 1997.

PE 2205 INTRODUCTION TO PETROLEUM ENGINEERING L T P C
3 0 0 3

AIM

To impart knowledge on worldwide Petroleum and Natural Gas Exploration and Production Industries.

OBJECTIVE

To provide an overview of Petroleum Engineering Industry including oil and gas reserves, petroleum industry, including oil and natural gas reserves, petroleum exploration and exploitation.

UNIT I **9**

Earth Sciences – Occurrence of Petroleum Rocks and traps. Reservoir rocks and properties. Reservoir mechanics and drive mechanism. Classification of oil and gas reserves.

UNIT II **9**

Drilling – Introduction to drilling of oil and gas wells. Drilling Rigs and equipments. Drilling fluids.

UNIT III **9**

Formation evaluation – Logging techniques. Various types of logs. Formation parameters. Log applications.

UNIT IV **9**

Petroleum Exploitation – Well testing and completion, Production potential and well performances. Material balance, Artificial lift, Improved recovery methods.

UNIT V **9**

Surface equipments – Wireline tools. Transportation of oil and gas, Oil pollution and control. Petroleum Economics, Supply and demand trends.

TOTAL : 45 PERIODS

TEXT BOOKS / REFERENCES

1. Geology of Petroleum by Leverson A.L.
2. Principles of oil production by T.E.W Nind
3. Introduction to Petroleum Engineering by Geltin

PE 2207 FLUID MECHANICS LABORATORY L T P C
0 0 3 2

AIM

To determine experimentally the flow characteristics of fluids and also to determine the efficiency of the flow measuring devices and fluid transport machineries.

OBJECTIVES

To give the exposure of all the fluid mechanics equipments and also to visualize the Fundamental concept of fluid mechanics.

LIST OF EXPERIMENTS

1. Calibration of constant and variable head meters
2. Calibration of weirs and notches
3. Determination of drag coefficient
4. Flow through straight pipe
5. Flow through annular pipe
6. Pressure drop studies in packed column
7. Minimum fluidization velocity in gas-solid and liquid -solid fluidization column
8. Open drum orifice and draining time
9. Flow through helical coil and spiral coil
10. Characteristic curves of pumps
11. Losses in pipe fittings and valves
12. Viscosity measurement of non Newtonian fluids.

TOTAL: 45 PERIODS

PE 2208 HEAT AMD MASS TRANSFER LABORATORY – I L T P C
0 0 3 2

AIM

To impart knowledge on how substances undergo the change in composition and change in phases during changes in temperatures.

OBJECTIVE

Students develop sound knowledge on heat and mass transfer operations

LIST OF EXPERIMENTS-HEAT TRANSFER LABORATORY

1. Determination of conduction parameters
2. To relate Heat transfer co-efficient with Reynolds number
3. To determine heat transfer coefficient in condenser.
4. To study the effect of stirring on heat transfer co-efficient
5. To study the effect of coil diameter on heat transfer coefficient
6. To determine the overall heat transfer coefficient

LIST OF EXPERIMENTS -MASS TRANSFER LABORATORY

7. To determine the critical moisture content and drying rate
8. To determine the critical moisture content and drying rate under vacuum
9. To verify Rayleigh equation
10. To determine the efficiency of steam distillation
11. To determine diffusion coefficient
12. To relate mass transfer coefficient with Reynolds number

TOTAL: 45 PERIODS

MA2263 PROBABILITY AND STATISTICS L T P C
3 1 0 4

(Common to Biotech, Chemical, Fashion, Petroleum, Polymer, Plastic)

OBJECTIVES

At the end of the course, the students would

- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

UNIT I RANDOM VARIABLES 9 + 3

Discrete and continuous random variables - Properties- Moments - Moment generating functions and their properties. Binomial, Poisson ,Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression – function of a random variable-Transformation of random variables - Central limit theorem.

UNIT III TESTING OF HYPOTHESIS 9 + 3

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT IV DESIGN OF EXPERIMENTS 9 + 3

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

UNIT V RELIABILTY AND QUALITY CONTROL 9 + 3

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) – control charts for attributes (p, c and np charts)

Note : Use of approved statistical table is permitted in the examination.

TOTAL : 60 PERIODS

TEXT BOOKS

1. J. S. Milton and J.C. Arnold, " Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007. (For units 1 and 2)
2. R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007)

REFERENCES

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
2. Navidi, W, "Statistics for Engineers and Scientists", Special Indian Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi,2008.
3. Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi ,2007.

PE2251 PETROLEUM REFINING AND PETROCHEMICALS L T P C
3 0 0 3

AIM

To provide an awareness to Petroleum Refining and Petrochemicals

OBJECTIVES

- To enable the students to learn various topics related to distillation, estimation of vapour liquid equilibria, types of distillation equipments and design of distillation columns.
- Students are expected to have sound knowledge on manufacturing process of petrochemicals

UNIT I **9**

Origin, exploration and production of Petroleum, Types of crudes, composition, characteristics, Products Pattern, Indigenous and imported crudes.

Crude heating, primary distillation principles, separation of cuts, gaps / overlaps, stripping. Desalting heat balance in distillation, energy input and recovery, vacuum distillation, types of trays, drawoffs, intermediate product, quality control.

UNIT II **9**

Lube oil and wax processing, solvent extraction, dewaxing desilting, deasphalting, clay contacting, principles operating parameters, feed and product equalities and yields.

Types and functions of secondary processing, cracking, thermal cracking and visbreaking, different feed stocks, products, yields and qualities.

UNIT III **9**

Fluid catalytic feed stocks and product yields and qualities. Catalyst and operating parameters.

Steam Reforming, Hydrogen, Synthesis gas, cracking of gaseous and liquid feed stocks, olefins, Diolofins, Acetylene and Aromatics and their separation.

UNIT IV **9**

Alkylation, oxidation, dehydrogenation, nitration,chlorination, sulphonation and isomerisation.

UNIT V **9**

Models and Techniquies, production of polyethylene, PVC, Polypropylene, SAN, ABS, SBR, Polyacrylonitrile, Polycarbonates, Polyurethanes, Nylon, PET

TOTAL : 45 PERIODS

TEXT BOOKS

1. B.K. Bhaskara Rao, “Modern Petroleum Refining Processes” Edition 3, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.
2. Groggins, “Unit Processing in Organic Synthesis” Edition 5, Tata McGraw Hill 1987

REFERENCES

1. Nelson W.L., “Petroleum Refinery Engineering”, McGraw Hill Publishing Company Limited, 1985
2. Watkins, R.N., “Petroleum Refinery Distillation, second edition, Gulf Publishing Company, Texas 1981

PE 2252 RESERVOIR ROCKS AND FLUID PROPERTIES L T P C
3 0 0 3

AIM

To impart knowledge on the fluid content of sub-surface rocks, salinity, permeability, fluid saturations, Darcy's law, the permeability co-efficient. The measurement of permeability. The permeability of dirty sands. Electrical and acoustic properties of reservoir rocks. Composition and phase diagrams of natural gases and pseudocritical properties of hydrocarbobs.

OBJECTIVES

At the end of the courses students will be in a position to have a knowledge on interpretation of fluid content data, fundamentals of the behaviour of hydro-carbon fluids and properties of water, brines and PVT properties of oil gas systems.

UNIT I **9**

The earth, crust, plate tectonics and geologic times. Sedimentary geology, Basins and Margins. Origin, accumulation and migration of petroleum. Properties of subsurface fluids. Petroleum Chemistry.

UNIT II **9**

Porosity and Permeability relationship – Porosity. Permeability. Porosity – Permeability relationship. Electrical properties of rocks. Measurement of formation resistivity. Correlation of FR with porosity, permeability and water saturation. FR of Shaley Reservoir rocks. Effect of stree on porous rocks. Formation evaluation.

UNIT III **9**

Capillary Pressure and Wellability – Fluid Satuaration and Capacity pressure. Determination of capillary pressure. Pore size distribution. Wettability. Evaluation of wettability and its effect on oil recovery. Alteration of wettability. Effect of wettability on electrical properties of rocks.

UNIT IV **9**

Linear flow of incompressible fluids. Darcy's Law. Linear flow of gas. Darcy's and Poiseuille's laws. Various flow systems. Multiple permeability rocks.

UNIT V **9**

Reservoir fluid properties – Phase behaviour of hydrocarbon system. Fluid rock interactions. Reservoir fluid characteristics. PVT analysis. Flash liberation and differential liberation study.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Craft, B.C. and Hawkins M.F. "Applied Petroleum Reservoir Engineering" second edition, Prentice-Hall (1991)
2. Djebbar Tiab : "Theory and pratice of measuring Reservoir rock and fluid Transport properties "

REFERENCE

1. Amyx, J.W., Bass D.M. & Whiting., R.L., "Petroleum Reservoir Engineering" McGraw Hill 1998.

PE 2253 FUNDAMENTALS OF PETROLEUM GEOLOGY L T P C
3 0 0 3

AIM

To develop a sound knowledge on nature and properties of rocks and minerals, sedimentation and sedimentary environments, geological and geophysical methods in petroleum exploration and development.

OBJECTIVES

At the end of the course students will be in a position to have knowledge on nature and geological properties of petroleum, petroleum generation, migration, entrapment and degradation, sedimentology of petroleum bearing sequences, primary and secondary porosity, structural and stratigraphic traps, formation of water, oil shale and other non-conventional petroleum sources.

Note : One day field excursion is a compulsory part of the course.

UNIT I **9**

Introduction to earth science - Origin of earth. Nature and properties of minerals and rocks. Sedimentation and sedimentary environment. Stratigraphy and geological time scale. Introduction of plate tectonics.

UNIT II **9**

Sedimentalogy of Petroleum bearing sequences - Sedimentary basins. Generation and Migration of Petroleum. Physical and Chemical properties of Petroleum.

UNIT III **9**

Subsurface Environment – Formation fluids – Composition, temperature, pressure and dynamics. Traps and Seals. The Reservoir. Generation and Migration and Distribution.

UNIT IV **9**

Exploration Methods - Well drilling. Formation Evaluation. Geophysical. Borehole Seismic and 4D Seismic. Subsurface geology.

UNIT V **9**

Non conventional petroleum resources and reserve estimation. – Plastic and solid hydrocarbons. Tar sands. Oil and gas shales. Coal bed methane. Assessment of reserves.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Cox, P.A., “The Elements on Earth”, Oxford University Press, Oxford 1995
2. Wilson, M., Igneous Petrogenesis”, Unwin Hyman, London 1989.

REFERENCES

1. Boggs, S., “Principles of Sedimentology and Stratigraphy”, second edition, Merrill Publishing Co., Toronto, 1995.
2. Krumblein, W.C. and Sloss, L.L., “Stratigraphy and Sedimentation”, second edition W.H. Freeman and Co., 1963.

PE2254 **GEOPHYSICS II** **L T P C**
3 0 0 3

AIM

To impart knowledge in the application of geophysics in 3D mapping of geological structures, interpretation of 2D and 3D seismic reflection data.

OBJECTIVES

Students will be able to understand mapping, structural interpretation, reservoir evaluation, inversion of seismic reflection data to determine petrophysical properties

UNIT I **9**

Geophysics as a toll for mapping of subsurface geological features – Introduction. Technology implementation. Seismic interpretation. Seismic characteristics and structural features. Pitfalls due to 3D effects and shallow features. Seismic stratigraphy. 3D data acquisition and processing.

UNIT II **9**

Work stations – Introduction. Hardware and Software. Work station capabilities. Display techniques. 3D visualization.

UNIT III **9**

3D Interpretation – Fault recognisation and mapping. Limitations on 2D fault mapping. Advantage of 3D diagram. 3D structural mapping. Stratigraphic interpretation. Analysis of direct hydrocarbon indicators. Summary.

UNIT IV **9**

Seismic attributes - Introduction. Classification of attributes. Reservoir properties, tectonics and fault planes. Lithology, structure and sedimentology. Discussion and conclusions. Dip and azimuth technology.

UNIT V **9**

Reservoir evolution – Reservoir management. Process model. Effect of rock and fluid properties. Flow surveillance and porocity calculations. 4D seismic. Inversion of seismic reflection data applications. 4D reservoir characterization.

TOTAL : 45 PERIODS

TEXT BOOKS

1. S.Boyer & J.J. MARI “Seismic Surveying and Well Logging” – Technip Editions, 2004
2. J.J. MARI & E. COPPENS “Well Seismic Surveying” – Technip Edition 2003

PE2255 RESERVOIR ENGINEERING I L T P C
3 0 0 3

AIM

To introduce the basic concept of Reservoir Engineering, estimation of hydrocarbon volume in place and recovery calculations.

OBJECTIVES

Students will be able to gain knowledge of Petroleum Reservoir, fundamentals of petrophysics, interrelation between petrophysical parameters capillary gravity equilibrium and initial fluid distribution.

At the end of the course students will also be in a position to have knowledge on relative permeability, capillary pressure, rock microstructure, multiphase flow, oil gas phase behviour, material balance equations and calculations of water influx from material balance.

UNIT I **9**

Introduction to Reservoir Engineering, Basic principles, definitions and data – Reservoir fluids, oil, gas, Gas formation volume factor, oil formation, volume factor, water formation volume factor – oil, gas water, rock compressibility – Resistivity index, wettabiity and contact angle, effective permeability characteristics, capillary pressure curves – Resistivity factors and saturation exponents. Fluid PVT analysis and oil gas phase behaviour.

UNIT II **9**

Formation evaluation – General material balance equations in oil or combination reservoirs, predicting primary recovery in solution – Gas Drive, Reservoirs. Definition and classification of Reserves – methods of estimating Reserves – Production decline cures. Secondary Recovery – pressure maintenance – gas injection – water injection – spacing of wells and well patterns – peripheral or central flooding.

UNIT III **9**

Fluid flow in reservoirs, Fluid movement in water flooded Reservoirs – Recovery efficiency – Areal or pattern. Sweep efficiency, - Vertical or invasion sweep efficiency, - Permeability variation – Cross flow – Estimates of volumetric sweep efficiency – Estimation of water flood recovery by material balance – prediction methods – Monitoring injectivity. Darey Law and application.

UNIT IV **9**

Recommended methods for assessing residual oil – Existing wells, new wells, Chemical Flooding, Gas injection, Thermal recovery – Well Testing.

UNIT V **9**

Well inflow equations for stabilized flow conditions. Constant terminal rate solution of the radial diffusivity equation and its application to oil well testing.

TOTAL : 45 PERIODS

TEXT BOOKS

1. L.P.Dake L Elsevier, “Fundamentals of Reservoir Engineering”, Development in Petroleum Science. 1980
2. Craft B.C and Hawkins M.F. – Applied Petroleum Reservoir Engineering” 2nd Edition. Prentice Hall Englewood Cliffs, N.J., 1991

REFERENCES

1. Dake, L.P. Practice of Reservoir Engineering Elsevier 2001
2. William C.Lyons, Gary J.Plisga “Standard Hand Book of Petroleum & Natural Gas Engineering” Second Edition – (Elsevier), Gulf Publishing, Burlington U.S.A (2005).

PE 2257 PETROLEUM TESTING LABORATORY L T P C
0 0 3 2

AIM

To introduce various methods of analysis by using sophisticated instruments and analytical equipments to determine various physical properties of crude, natural gas, petroleum products and petro-chemicals

OBJECTIVES

On completion of the course, the students should be conversant with the theoretical principles and experimental procedures for quantitative estimation.

List of Experiments:

1. Aromatic content Determination
2. Carbon residue determination
3. Karl-Fisher Conductometer Apparatus for water estimation
4. Foaming characteristics of lube oil
5. Mercaptan as sulphur estimation
6. Copper Corrosion test of petroleum oil
7. Freezing point of Aqueous Engine coolant solution
8. Automatic Vacuum Distillation
9. Characteristics of Hydrocarbon in Petroleum products
10. Coking tendency of oil
11. Testing of Petroleum products using Saybolt

TOTAL: 45 PERIODS

List of Equipments

1. Conradson Apparatus	2
2. Karl –Fisher	2
3. Dr. Test Apparatus	2
4. Bomb Calorimeter	2
5. API Distillation Apparatus	2
6. Junkers Gas Calorimeter	2
7. Abbey Refractometer	2
8. Mercaptan as sulphur Estimation Apparatus	2

PE 2258 HEAT AND MASS TRANSFER LABORATORY – II L T P C
0 0 3 2

AIM

To provide practical knowledge on various types of heat and mass transfer equipments.

OBJECTIVES

Students gain practical knowledge in various distillation columns, extraction columns and chemical reactors.

Students develop a sound knowledge on collection of data by experiments which can be used for the design of heat and mass transfer equipments

List of Experiments:

1. Determination of Bubble Point and Dew Point
2. Study of X-Y data in multicomponent system and determination of number of trays.
3. Extraction in Binary Systems
4. Extraction in Multicomponent systems
5. Steam distillation using Benzene - Toluene system
6. Study of Reaction Kinetics in CSTR
7. Study of Reaction Kinetics in Plug Flow reactors
8. Study of Reaction Kinetics in mixed reactors
9. Fluidized bed reactors
10. Study of Filtration characteristics

TOTAL : 45 PERIODS

List of Equipments

1. Packed Distillation Column	2
2. Bubble Cap Distillation Column	2
3. Tray Type Distillation Column	2
4. Spray Column	1
5. Rotary Disc Contractor	1
6. Steam Distillation	2
7. Vapour –Liquid Equilibrium	3
8. Filter Press	1
9. CSTR	1
10. Plug Flow Reactor	1
11. Mixed Reactors	1
12. Fluidized Bed Reactor	1

PE2301 WELL DRILLING EQUIPMENTS AND OPERATIONS L T P C
3 0 0 3

AIM

The Main aim is to understand the Well Drilling Equipments

OBJECTIVES

The objective of learning this subject is the students will understand the Drilling Process and Drilling Equipments**.**

UNIT I **9**

Drilling operations – Location to Rig. Release Well Bore Diagram, Crews – Operator – Drilling, contractor – Third Party Services – Rig Types – Land Types – Marine types.

UNIT II **9**

Components- Overall Drilling Rig, Drilling Sub systems – Power – Hoisting Line – speeds and Loads Power – Loading Components – Drill Pipe, Heavy Weight Drill Pipe (HWDP), Drill String Loads Uniaxial.

UNIT III **9**

Directional Drilling, Well Planning, Two Dimensional, Horizontal, Tools, Techniques, MWD, surveying – Radius of Curvature, Long's Method – Errors, Mud, Mud Use, Property measurements, Types, - Pneumatic (Air, Gas, Mist, Foam), Water based, Oil based, solids Control, Definitions, Equipment, Problems, Contaminations Effect.

UNIT IV **9**

Hydraulics, Classifications of Fluids, Rheological Models – Rotary Drilling Hydraulics – Jet Hydraulic Optimizing and Maximizing – Circulations Rate Selection – Drill Bit – Jet Sizing – Equivalent Circulations Density, Hole Cleaning. Theory – Vertical and Deviated Holes, Annular Velocities – Carrying Capacity – Pills and Slugs.

UNIT V **9**

Origin of Overpressure, Kick Signs, shut –in Procedures, Kill sheets, Kill Procedures, Driller's Methods – Engineer's Method (Wait and Weight)

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rabia.H. 'Oil Well Drilling Engineering, Principles And Practices' Graham And Trotman Ltd. 1985.
2. D.P Helander 'Fundamentals Of Formation Evaluation'

REFERENCE

1. Standard Handbook of Petroleum and Natural Gas Engineering, 2nd Edition, William C Lyons, Gary C Pilisga, Gulf Professional Publishing

PE2302 **WELL LOGGING** **L T P C**
3 0 0 3

AIM

The main aim of learning this subject is that student will be able to understand the well logging theory and practicing methods.

OBJECTIVES

The objective of this course is to have in-depth knowledge is GR logging, SP logging, NMR logging and will be able to interpret different cross plots.

UNIT I **9**

Aims and objectives of well logging, Reservoir formations, Borehole conditions. Fundamental concepts in borehole geophysics physical properties of reservoir rocks, Formation parameters and their relationships: formation factor, porosity, permeability, resistivity, water and hydrocarbon saturations, and movable oil. Archie's and Humbles equations.

UNIT II **9**

Principles, instrumentation, operational procedures and applications of different geophysical logs: S.P., electrical, induction, nuclear, sonic, caliper, temperature, dip and direction. Natural gamma ray spectrometry log, nuclear magnetic log, litho density log, neutron activation technique, thermal neutron decay time log, chlorine and oxygen logs.

UNIT III **9**

Recording, transmission and processing of log data, Formation evaluation for hydrocarbons, Qualitative and quantitative interpretations of well log data, Overlays and cross-plots, Determination of reservoir parameters – porosity, resistivity, permeability, water and hydrocarbon saturation, movable oil. Lithology determination by neutron, density and sonic cross-plots, dual mineral method, triporosity method, litho porosity cross-plot (M-N plot), clean sand and shaly sand interpretations.

UNIT IV **9**

Sub-surface correlation and mapping from log data. Delineation of fractures from logs, Production logging, and Well logging for metallic and non-metallic minerals: radioactive and non-radioactive evaporates, coal, sulfur. Borehole geophysics for groundwater exploration, Effective pay thickness of an aquifer, Saline water-fresh water interface from log data. Determination of ground water flow direction by logs.

UNIT V **9**

Theoretical computations of normal and lateral log responses, Identification and delineation of sub-surface formations from well log data, Calculation of reservoir parameters: formation factor, porosity, permeability, resistivity, water and hydrocarbon saturations, and movable oil. Sub-surface correlation of formations and interpretation of field data.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Standard Handbook of petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.
2. D.P Helander 'Fundamentals Of Formation Evaluation'
3. Dewan.J.T 'Essentials of Modern Open-Hole Log Interpretation' Pen Well Books, 1983, ISBN 0878142339.

REFERENCE

1. Serra.O 'Fundamentals of Well log Interpretation' Volume1. Elsevier Science Publisher, New York, 1984, ISBN 04441327.

PE2303 DRILLING FLUIDS AND CEMENTING TECHNIQUES **L T P C**
3 0 0 3

AIM

The main aim is to understand the fundamentals of drilling fluids and cementing technology.

OBJECTIVES

The objective is that students will be able to understand the different types of drilling fluids used in the drilling process and different stages of cementing techniques.

UNIT I **9**

Introduction to the basic functions and properties of drilling fluids and cement slurries, Compositions and related properties of drilling fluids and cement slurries.

UNIT II **9**

Drilling fluids – classification – water base drilling fluids. Testing of drilling fluids, Drilling fluid additives**.**

UNIT III **9**

Types of equipment and methods used in cementing operations, Drilling fluid and cement slurry hydraulics.

UNIT IV **9**

Determination of torque and drag, Calculation of cutting transport efficiency, Placement technique of cements. Gas migration through cement columns.

UNIT V **9**

Will cementing – chemistry of cements. Cementing principles – primary cementing, secondary cementing, linear cementing, plug cementing, single stage cementing and multistage casing cementing.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rabia.H. 'Oil Well Drilling Engineering, Principles and Practices' Graham and Trotman Ltd. 1985.
2. Smith.P.K 'Cementing' SPE Publications 2nd Edition 1976.
3. Cementing Technology – Powel Schlumberger Publication 1984.

REFERENCES

1. McCray. A.W and Cole.F.W. 'Oil Well Drilling Technology' University of Oklahoma Press, Norman 1959.
2. Standard Handbook of petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Profession.

PE2304 FIELD DEVELOPMENT GEOLOGY **L T P C**
3 0 0 3

AIM

The main aim is to understand the fundamental filed Geology for interpretation.

OBJECTIVES

The objective is that students will be able to understand the different types filed recognition geological structure and tools and use the same for the various applications.

UNIT I **9**

Structural Elements: Dip and Strata – True dip, Apparent dip, Strike, Measurement of dip and strikes, important for Dip and Strike, - Out crops, Outcrops pattern, topography and Geological Structures, Brunton compass, Clinometer, Global Positioning systems**.**

UNIT II **9**

Identifications of Rocks in the fields, Techniques adopted – Fold, Faults, Joints – definition, Types, Classifications do Geological Importance.

UNIT III **9**

Introduction to Stratigraphy – Geological Time – Scale – Bio – Stratigraphy – Chrono Stratigraphy. Collection of samples, Sedimentary basins, Lithological arrangements.

UNIT IV **9**

Introduction to micro fossils – types of fossils – Importance of Micro fossils – Applications of Micro fossils in Hydrocarbon explorations**.**

UNIT V **9**

Introduction to Remote Sensing – Aerial Photographs – types of Aerial Photographs – Photo Interpretation elements - Satellite Images – Interpretation using satellite imageries – Applications of Remote Sensing in Hydrocarbon Explorations**.**

TOTAL: 45 PERIODS

TEXT BOOKS

1. Krishnan, M.S., Geology of India and Burma Badgley, P.C., 1965, Structure and tectonics, Harper and Row Billings, Structural Geology
2. Bhagawan Sahay - Petroleum Exploration and Exploitation Practices Miller,V.C., 1961, Photogeology., McGraw Hill.
3. Sabbins, F.F., 1985, Remote Sensing – Principles and Applications. Freeman.
4. Ray, R.G., 1969, Aerial Photographs in Geologic Interpretations. USGS Prof. Paper 373.

PE2305 **RESERVOIR ENGINEERING - II** **L T P C**
3 0 0 3

AIM

The aim of this learning this subject is that student will able to follow and understand. The reservoir concepts such as reservoir simulation, rock characteristics and reservoir management**.**

OBJECTIVES

The main of objective is that after learning student will able to interpret cross plots, well characteristics, simulation and gas condensate reservoirs**.**

UNIT I **9**

Fluid characteristics. Introduction to the production system. Characteristics of the reservoir rocks. Porosity, Permeability cross plots. Fluid saturation, capillary pressure**.**

UNIT II **9**

Multi phase flow: Relative permeability: fractional flow. Well performance – inflow performance, tubing performance.

UNIT III **9**

Well testing – Basic well testing theory – oil well testing: gas well testing – Practical well testing – Gas field reservoir engineering – Fluid phase behavior – Gas in place volumes and recovery estimations. Reservoir testing and performance analysis: well test – drillstem tests (DST); production tests, pressure tests on gas wells; formation interval testing and other well testing techniques. Coning of water and gas; effects of partial penetration.

UNIT IV **9**

Material balance techniques: Production forecasting – Gas condensate reservoir engineering Fluid phase behavior development – options.

UNIT V **9**

Well performance – Reservoir management and simulation – reservoir data acquisition – Reservoir simulation. Mathematical basis of bottom hole analysis; Differential equations for radial flow in a porous medium. Pressure draw down and build up analysis.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Amyx.J.W. et al. "Petroleum reservoir engineering" – Mc.Graw-hill-1998.
2. Archer.J.s and Wall C.C. "Petroleum engineering principles and practice", kluwer 1990.

REFERENCE

1. Craft B.C. and Hawkins M.P. "Applied Petroleum reservoir engineering" 2-nd Edition Prentice hall – 1991.

PE2306 WATER FLOODING AND ENHANCED OIL RECOVERY **L T P C**
3 0 0 3

AIM

The main of the learning the subject is that student will be able to understand. The basic of oil recovery methods in oil & gas Industry.

OBJECTIVES

Students will be able to get the clear idea, better understanding and can get introduced with Different types of recovery methods which are employed in the oil and gas Engineering.

UNIT I **9**

Enhanced oil recovery methods – Definition – Schematic representation of enhanced oil Recovery – Techniques involved in EOR – Chemical flooding – Hydrocarbon or Gas injection – Thermal recovery methods.

UNIT II **9**

Chemical oil recovery methods – Polymer, surfactant/polymer and alkaline flooding – Carbon dioxide (CO_2) flooding.

UNIT III **9**

Thermal recovery – fire flooding – steam flooding – mechanism of hydrocarbon miscible flooding – mechanism of nitrogen and flue gas flooding – mechanism of CO_2 flooding – Mechanism of surfactant / polymer flooding – Mechanism of alkaline flooding – Mechanism of steam flooding.

UNIT IV **9**

Criteria for gas injection - Criteria for chemical methods – Criteria for thermal methods. Microbial EOR methods (MEOR).

UNIT V **9**

Laboratory design for EOR – Preliminary test – Water analysis – Oil analysis – Core testing – Viscosity testing.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Von Pollen. H.K. and Associates. Inc., "Fundamentals of Enhanced oil Recovery" – Penn Well publishing co., Tulsa (1980).
2. Latil.M. et al., "Enhanced oil recovery" – Gulf publishing co. Houston (1980)

REFERENCE

1. Standard Hand Book of Petroleum & Natural Gas Engineering" – 2nd Edition 2005-William C.Lyons & Gary J.Plisga -Gulf professional publishing comp (Elsevier).

GE2321 COMMUNICATION SKILLS LABORATORY

(Fifth / Sixth Semester) **L T P C**

0 0 4 2

Globalization has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	**(Weightage 40%)**	**24 periods**

A. ENGLISH LANGUAGE LAB **(18 Periods)**

1. LISTENING COMPREHENSION: **(6)**

Listening and typing – Listening and sequencing of sentences – Filling in the blanks -Listening and answering questions.

2. READING COMPREHENSION: **(6)**

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: **(6)**

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)

(Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING (1)
Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: (1)
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: (2)
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. GROUP DISCUSSION: (1)
Why is GD part of selection process? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. INTERVIEW SKILLS: (1)
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

II. Practice Session	**(Weightage – 60%)**	**24 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their Own resume and report. **(2)**
2. **Presentation Skills:** Students make presentations on given topics. **(8)**
3. **Group Discussion**: Students participate in group discussions. **(6)**
4. **Interview Skills**: Students participate in Mock Interviews **(8)**

REFERENCES

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth , Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decision maker**, Cambridge University Press, 1997.
5. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

LAB REQUIREMENT

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

Guidelines for the course

GE2321 COMMUNICATION SKILLS LABORATORY

A batch of 60 / 120 students is divided into two groups – one group for the PC- based session and the other group for the Class room session.

The English Lab (2 Periods) will be handled by a faculty member of the **English Department**. The Career Lab (2 Periods) may be handled by any competent teacher, **not necessarily from English Department**

Record Notebook: At the end of each session of English Lab, review exercises are given for the students to answer and the computer evaluated sheets are to be compiled as record notebook. Similar exercises for the career lab are to be compiled in the record notebook.

Internal Assessment: The 15 marks (the other 5 marks for attendance) allotted for the internal assessment will be based on the record notebook compiled by the candidate. 10 marks may be allotted for English Lab component and 5 marks for the Career Lab component.

End semester Examination: The end-semester examination carries 40% weightage for English Lab and 60% weightage for Career Lab.

Each candidate will have separate sets of questions assigned by the teacher using the teacher-console enabling PC–based evaluation for the 40% of marks allotted.

The Career Lab component will be evaluated for a maximum of 60% by a local examiner & an external examiner drafted from other Institutions, similar to any other lab examination conducted by Anna University.

Requirement for a batch of 60 students

Sl.No.	Description of Equipment	Quantity required
1.	**Server**	1 No.
	o PIV system	
	o 1 GB RAM / 40 GB HDD	
	o OS: Win 2000 server	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
2.	**Client Systems**	60 No.
	o PIII or above	
	o 256 or 512 MB RAM / 40 GB HDD	
	o OS: Win 2000	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
3.	Handicam Video Camera (with video lights and mic input)	1 No.

4.	Television - 29”	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility - **Desirable**	1 No.

PE2307 DRILLING FLUIDS AND CEMENTING TECHNIQUES LAB L T P C
0 0 3 2

AIM

The main aim of this laboratory is to understand the drilling fluid equipment, Principles and operation and oil well cement properties.

OBJECTIVES

The objectives of this laboratory are to demonstrate the processes involved in drilling and cementing operations, introduce laboratory techniques which are used to select and optimize drilling fluids and cement slurry and to develop interest in experimentation.

1. Drilling Fluid properties measurements using: Mud balance – Determination on density or weight of a drilling mud.
2. Determination of thickening time of cement slurries using Fann consistometer.
3. Determination and measurement of fluid loss and mud cake properties of a drilling fluid using a low pressure – Low temperature and High temperature filter and Filter press.
4. Picnometer and F.G.T. meter
5. pH and resistivity emulsion.
6. Test cell meters.
7. Oil well cement properties; measurement of the compressive strength or tensile strength of the cement at pressure up to 21000 Kpa and maximum temperature of 260^{o}C.
8. Measurement and control of the basic properties of drilling fluids (density, viscosity, filtration, lubricity and electrochemical properties) and cement slurries (density, viscosity, filtration, thickening time and mechanical properties).

LIST OF EQUIPMENT

1. Mud balance
2. Picnometer and F.G.T meter
3. Filter press, low pressure – Low temperature and high temperature filters
4. pH meter
5. Test cell meters
6. Fann consistometers
7. Compact Curing chamber
8. Thickening time tester

TOTAL: 45 PERIODS

PE2308 GEOLOGY LABORATORY L T P C
0 0 3 2

AIM

The main aim of this laboratory is to understand the preparation of Geological maps and identify the rock specimens by Megascopic and Microscopic, Identify the Depositional environment and Sediment types.

OBJECTIVE

The objectives of this laboratory are to demonstrate the various methods involved in the preparation of structural maps and interpretation and calculation the thickness of the beds, studying depositional environment using grain size analysis and find out sediment types using Sand – Silt – Clay ratio**.**

1) Calculation of True and Apparent Dip.
2) Estimation of Thickness, Distance and Depth of the ore body.
3) Estimation of Throw and Nature of the fault.
4) Interpretation of surface Geology using contour maps.
5) Sand – Silt – Clay ratio estimation.
6) Grain – Size analysis.
7) Identification of important sedimentary rocks in hand specimen.
8) Identification of important sedimentary rocks in microscopic level

EQUIPMENT

1) Sieve Shakers
2) Sieves set.
3) Petrological Microscopes
4) Hot even
5) 1000 ml and 50 ml beakers

TOTAL: 45 PERIODS

PE2351 RESERVOIR CHARACTERIZATION AND MODELING L T P C
3 0 0 3

AIM

The main of learning this subject is that student will be able understand the Basic reservoir characterization, modeling and simulation methods used in oil industry.

OBJECTIVE

The objective of this subject is that student will be able to follow and utilize the different concepts of reservoir modeling and characteristics and their usage.

UNIT I **9**

Overview of reservoir characterization and modeling problems. Reservoir mapping. 3D modeling. Univariate, bivariate and multivariate statistics for geological data analysis.

UNIT II **9**

Pattern recognition techniques. Petrophysical predictions from well logs. Introduction to petroleum geostatitsics. Variograms. Kringin. Uncertanity quantification.

UNIT III **9**

Stochastic reservoir modeling. Sequential simulation. Gaussian simulation. Indicator simulation. Integrating seismic attributes, well tests and production data. Constraining reservoir models with various sources of information. Reservoir up girding and upscaling.

UNIT IV **9**

Reservoir simulation – Investigation of petroleum reservoir characteristics and behavior, including: pore volume, fluid distribution and movement, and recovery. The result of simulation studies include optimized field development and management plans which maximize the value and/or reserves of producing properties. Finite difference approximations to the diffusivity equation and the application of those approximations for reservoir simulations. Practical use of reservoir simulation.

UNIT V **9**

Pressure transient interpretation. Seismic reservoir charactreisation. Log management, correlation and petrophysical analysis. Geology correlator probe – AVO Reservoir Characterization. Software used in reservoir characterization and modeling.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Petroleum Exploration Hand Book by Moody, G.B.
2. Wellsite Geological Techniques for petroleum Exploration by Shay's et al.

REFERENCE

1. Standard Hand Book of Petroleum & Natural Gas Engineering" – 2nd Edition 2005-William C.Lyons & Gary J.Plisga-Gulf professional publishing comp (Elsevier).

PE2352 PETROLEUM PRODUCTION ENGINEERING **L T P C**
3 0 0 3

AIM

The main of learning this subject is that student will be able to understand the basics of oil and gas production engineering techniques.

OBJECTIVE

The objective of studying this subject is that student will be able practice both theory and practical of different production operations in the oil and gas wells such as artificial lifts and subsurface equipments.

UNIT I **9**

Components of the petroleum systems. Well productivity engineering. Production from under saturated oil reservoirs. Production from two-phase reservoirs. Production from gas reservoirs. Pseudo critical properties of natural gases. Gas well deliverability for non – Darcy flow.

UNIT II **9**

The near-well bore condition and damage characterization, the effect of perforation conditions on well performance. Well bore flow performance. Well deliverability. Well head surface gathering systems. Artifical lift systems. Horizontal well production. System analysis. Production Chemistry Basics (Wax, Scale, Corrosion, Emulsions).

UNIT III **9**

Surface equipment and operations. Flow control and well heads. Gathering systems;service and cleaning systems; design and testing of flow lines. Separation and separators; separator components, stage separation; design and construction of separators. Meeting - Oil and gas metering techniques.

UNIT IV **9**

Flow measurement system; liquid level controllers. Emulsion problems; oil emulsions; emulsifying agents and de-emulsifiers, choice and dosage of de-emulsifiers, heat treatment, heat treaters, desalting, oil storage and tank farms. Gauging, sampling and quality control. Underground storage – caverns etc. Water disposal, corrosion. Water injection systems. Subsurface equipment**.**

UNIT V **9**

Well completion techniques and equipment, drill stem test (DST) flowing well performance, vertical lift performance, optimum size tubing and chokes, production forecast for a pool. Design and analysis of artificial methods of petroleum production. Work over and sand exclusion technique**.**

TOTAL: 45 PERIODS

TEXT BOOKS

1. "Gas Production Engineering" – S.Kumar-Gulf publishing Co., - 1987.
2. T.E.W.Nind"Principles of well Produciton"-2nd Edition.Mc.Graw hill Book-Co. Ltd, Newyork 1981. ISBN 0070465762.

REFERENCE

1. T.O.allen and A.P.Roberts. "Production operations" –SPE - Vol-I 4-th edition.

PE2353 WELL COMPLETION TESTING AND WORK OVER **L T P C**
3 0 0 3

AIM

The main of learning this subject is that student will be able to understand the basics of Well Completion techniques.

OBJECTIVE

The objective of studying this subject is that student will be able to complete the Well Operation during the hydrocarbon Explorations.

UNIT I **9**

Well design: Prediction of formation pore pressure and stress gradients. Determination of safety mud weight bounds for different in-situ stress conditions. Design and planning well trajectory. Surveying tools and methods**.**

UNIT II **9**

Design of drill string including bottom hole (BHA) assembly. Drilling methods and equipment for directional, horizontal and multilateral wells. Selection of casing shoes, material properties and design of casing program**.**

UNIT III **9**

Well Completion and Stimulations: Well completion design, types of completion, completion selection and design criteria. Interval selection and productivity considerations: effects of producing mechanisms. Inflow performance and multiple tubing performance analyses using commercial software.

UNIT IV **9**

Well stimulation and workover planning. Tubing-packer movement and forces. Tubing design: graphical tubing design and simplified tensional strength design. Selection of down hole equipment, tubing accessories and wellhead equipment.

UNIT V **9**

Basics of perforation, selection of equipment and procedure for perforation oil and gas wells. Technology of sand control: gravel packing. Fundamentals of well stimulation technologies: acidization and hydraulic fracturing.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Wellsite Geological Techniques for Petroleum exploration by Sahay .B. et al
2. Petroleum Exploration Hand Book by Moody, G.B.

REFERENCE

1. Standard Hand Book of Petroleum & Natural Gas Engineering" – 2nd Edition 2005-William C.Lyons & GaryJ.Plisga-Gulf professional publishing comp (Elsevier).

GE2021 ENVIRONMENTAL SCIENCE & ENGINEERING **L T P C**
3 0 0 3

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional Endeavour that they participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity

definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCES

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
1. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
2. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

PE2355 PETROLEUM ECONOMICS L T P C
3 0 0 3

AIM

To introduce the students concept and fundamentals of engineering economics of energy industry.

OBJECTIVES

To make the students understand the basic quantitative theories and methodologist in oil sector.

UNIT I **9**

Supply and demand curves, the elasticity of supply and demand, public finance concepts such as consumer surplus, excise and export taxes. Forecasting techniques for the energy industry, including energy prices. Demand and supply for natural gas, cured oil and pipeline transportation, determinants of energy demand, energy markets, energy pricing, stability and performance of energy markets.

UNIT II **9**

The economics of investment, Discounted cash flow analysis, Cost Benefit Analyses, Internal Rate of Return, NPV, Profitability Index, Natural Monopoly theory, National competition Policy, Gas Market Regulation, taxation of the oil and gas industry, government policy and trade permits, Monte Carlo analysis, Net Back Pricing, Transfer Pricing and regulatory aspects.

UNIT III **9**

Application of petroleum engineering principles and economics to the evaluation of oil and gas projects, evaluation principles, time value of money concepts, investment measures, cost estimation, price and production forecasting, risk and uncertainty, project selection and capital budgeting inflation, escalation, operating costs, depreciation, cost recovery**.**

UNIT IV **9**

Petroleum exploration and production contracts. Sharing of the economic rent, portfolio management. Value creation, Corporate finance & return on capital, economic appraisal methods for oil filed development, reservoir model costs and calculations.

UNIT V **9**

Case studies: Economic study of an oil filed development project, petrochemical plant project, natural gas break even price, natural gas liquefaction cost, LGN transport cost, investment profitability study for a gas pipeline.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Industrial Economics – An Introductory Textbook. R.R.Barthwal, 2nd Edition, New Age International Publisher.
2. Managerial Economics – D.N.Divedi. 6th Revised Edition. Vikas Publishing House Private Ltd.
3. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary, C Plisga. Gulf Professional Publishing.

REFERENCES

1. Petroleum Engineering Handbook. Bradely, H.B. Society of Petroleum Engineers. Richardson. Texas.
2. The Encyclopedia Americana, International Edition Volume 9, Grolier Incorporated.

PE2356 NATURAL GAS ENGINEERING L T P C
3 0 0 3

AIM

The main of learning this subject is that student will be able to understand the basics of Natural Gas engineering techniques.

OBJECTIVE

The objective of studying this subject is that student will be understanding the basic concept and applications of Natural Gas Engineering.

UNIT I **9**

Natural gas technology and earth science: Branches of petroleum Industry. Sources of Information for natural gas engineering and its applications. Geology and earth sciences: Earth sciences-Historical geology, Sedimentation process, Petroleum reservoirs, Origin of petroleum. Earth temperatures & pressure, Earth temperatures, Earth pressure. Petroleum : Natural gas, LP gas, Condensate, & Crude oil.

UNIT II **9**

Properties of Natural Gases: typical compositions. Equations of state: general cubic equations, specific high accuracy equations. Use of equation of state to find residual energy properties, gas measurement gas hydrates, condensate stabilization, acid gas treating, gas dehydrations, compressors, process control deliverability test, gathering and transmission, and natural gas liquefaction.

UNIT III **9**

Gas Compression: Positive displacement and centrifugal compressors; fans. Calculation of poser requirements. Compressible Flow in Pipes: Fundamental equations of flow: continuity, momentum, elegy equations.

UNIT IV **9**

Isothermal flow in pipes: the Weymouth equation. Static and flowing bottom-hole pressures in wells. Fundamentals of Gas flow in porous media: Steady state flow equations. Definition of pseudo-pressure function. Gas flow in cylindrical reservoirs: general equation for radial flow of gases in symmetrical homogeneous reservoirs.

UNIT V **9**

Non-dimensional forms of the equation; derivation of coefficients relation dimensionless to real variables. Infinite reservoir solution: Pseudo-steady-state solution. Gas Well Deliverability Tests: Flow-after-flow tests: prediction of IPR curve and AOF for the well. Isochronal tests. Draw down tests: need for data at two flow rates.

TOTAL : 45 PERIODS

TEXT BOOK

1. Katz D.L.et al., Natural Gas Engineering (Production & storage), McGraw-Hill, Singapore.

REFERENCE

1. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.

PE 2357 PETROLEUM TRANSPORTATION DESIGN L T P C
0 0 3 3

1. Introduction to sketching lettering and lines.
2. Drafting Equipment and Media.
3. Computer Aided Design – Basic Drawing functions.
4. Geometric Construction and Geometric Tolerance.
5. CADD Design of any one tool used in Petroleum.
6. Solid modeling Animation Virtual Reality.
7. Design of Piping.
8. Design of Tubing and Fluid movement in Water.
9. Design of Oil Beam.
10. Design of De-gasifier.
11. Design of settling Tank of Hydrocarbon.
12. Demonstration of Rotary equipment.
13. Demonstration of Mud pumps.

TOTAL : 45 PERIODS

PE2358 PROCESS CONTROL AND INSTRUMENTATION LABORATORY

L T P C
0 0 3 3

PROCESS CONTROL LAB:

- Operation of interacting and non-interacting systems.
- Closed loop response of Flow control loop.
- Closed loop response of Level control loop.
- Closed loop response of Temperature control loop .
- Closed loop response of Pressure control loop.
- Study of complex control system (ratio/cascade/feed forward)

INSTRUMENTATION LAB:

a. Calibration of Flow meter.
b. Viscosity measurement.
c. pH meter standardization and measurement of pH values of solution.
d. Calibration of pressure gauge.
e. Conductivity meter calibration and measurement of conductivity test solution.
f. IR spectrophotometer.

TOTAL : 45 PERIODS

EQUIPMENT REQUIRED.

i. Rota meter.
ii. Say bolt viscometer.
iii. Redwood viscometer.
iv. Engler viscometer.
v. U tube viscometer.
vi. ph meter.
vii. Dead weight tester.
viii. Pressure Gange.
ix. Conductivity meter.
x. IR spectro photometer.

PE2401 ONSHORE AND OFFSHORE ENGINEERING AND TECHNOLOGY

L	T	P	C
3	0	0	3

UNIT I **9**

Introduction to offshore oil and gas operations.. Sea States and Weather, Offshore Fixed and mobile Units, Offshore Drilling, Difference in drilling from land, from fixed platform, jack up, ships and semi submersibles. Offshore Well Completion, Offshore Production systems, Deep-water technology, Divers and Safety, Offshore Environment**.**

UNIT II **9**

Introduction; classification, properties of marine sediments. Consolidation and shear strength characteristics of marine sediments. Planning and site exploration.

UNIT III **9**

Drilling. Sampling techniques. Laboratory testing, In situ testing methods and geophysical methods. Current design practices of pile supported and gravity offshore structures**.**

UNIT IV **9**

Dynamic analysis of offshore structures. Centrifugal modeling. Anchor design. Break out resistance analysis and geotechnical aspects of offshore pipeline and cable design. Field instrumentation and performance observation.

UNIT V **9**

Offshore soil mechanics; Offshore pile foundations and caissons; Design of breakwaters; Buoy design and mooring systems; Offshore drilling systems and types of platforms; Ocean mining and energy systems. ROV. Onshore drilling-on shore oil rigs. onshore drilling equipments-onshore rig structures-hydraulics applied in onshore rigs.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Standard Hand Book of Petroleum & Natural Gas Engineering" – 2nd Edition 2005-William C.Lyons & Gary Gulf-Gulf professional publishing comp (Elsevier).
2. Wellsite Geological Techniques for petroleum Exploration by Sahay.B et al.

REFERENCE

1. Petroleum Exploration Hand Book by Moody, G.B.

PE2402 INTEGRATED OIL / GAS FIELD EVALUATION L T P C
3 0 0 3

AIM

To impart knowledge in the different analysis of oil/gas field evaluation in order to maximize the production and improvement of facilities.

OBJECTIVE

Students will be able to understand the different evaluation methods of oil/gas fields and reserves.

UNIT I **9**

Geological studies: - Structural contour maps and various geological models. Estimation of reserves. Hydrodynamic Study, Techno-economic Evaluation for normal and marginal fields. Innovative ways to asset development**.**

UNIT II **9**

Petroleum project evaluation-mineral project evaluation case studies. The design and evaluation of well drilling systems-Economic appraisal methods for oil field developmental project evaluation including risk analysis, probability and statistics in decision-making and evaluations. case studies.

UNIT III **9**

An integrated reservoir description in petroleum engineering-usage of geophysical, geological, petrophysical and engineering data-emphasis on reservoir and well data analysis and interpretation, reservoir modeling (simulation), reservoir management (production optimization of oil and gas fields) and economic analysis (property evaluation)

UNIT IV **9**

An integrated reservoir development in petroleum engineering-reservoir and well evaluation-production optimization-nodal analysis, stimulation, artificial lift facilities-surveillance.

UNIT V **9**

Evaluation of well completions-placement of casing, liners and well tubing. Evaluation, performance of horizontal wells. Evaluation of acidization treatments.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Katz D.L.et al., Natural Gas Engineering (Production & storage), McGraw-Hill, Singapore.
2. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.
3. Mc.Cray. A.W and Cole.F.W. 'Oil Well Drilling Technology' University of Oklahoma Press, Norman 1959.

PE2403 PETROLEUM EQUIPMENT DESIGN L T P C
3 0 0 3

AIM

To understand the concept of designing Equipments for Petroleum Exploration

OBJECTIVE

To study and anlayse the suitable equipment for particular reservoir conditions.

UNIT I **9**

Casing program, casing and tubing design, principles of cementing, completion added skin, well perforating, hydraulic fracturing. DRILL BIT DESIGN.ROLLER CONE BITS.PDC DRILL BITS.NOMENCLATURE AND IADC CODES for drill bits. BHA (Bottom hole assembly). ESP(Electrical submersible pumps). SRP(Sucker rod pumping) unit design.

UNIT II **9**

Design of Surface Facilities -Design of production and processing equipment, including deparation problems, treating, and transmission systems.

UNIT III **9**

Capstone design Student teams apply knowledge in the areas of geology, reservoir engineering, production, drilling and well completions to practical design problems based on real field data with all of the associated shortcomings and uncertainties. Use of commercial software.

UNIT IV **9**

Oil desalting-horizontal and spherical electrical dehydrators- Natural Gas Dehydration-Horton sphere- Natural Gas Sweetening. Crude & Condensate Stabilization-design of stabilizer- Oil and Gas Treatment. Treating Equipment.

UNIT V **9**

Refinery Equipment Design-atmospheric distillation column Design and construction of on/ offshore pipelines, Fields Problems in pipeline, Hydrates, scaling & wax etc and their mitigation..

TOTAL : 45 PERIODS

TEXT BOOKS

1. Petroleum Exploration Hand Book by Moody, G.B.
2. Wellsite Geological Techniques for petroleum Exploration by Sahay.B et al

REFERENCE

1. Standard Hand Book of Petroleum & Natural Gas Engineering" – 2nd Edition 2005-William C.Lyons & Gary J.Plisga-Gulf professional publishing comp (Elsevier).

PE2404 NUMERICAL RESERVOIR SIMULATION L T P C
3 0 0 3

AIM

The main of learning this subject is that student will be able to understand the basics of Mathematics in Reservoir applications. .

OBJECTIVE

The objective of studying this subject is that student will be understanding the basic concept and applications of Numerical Methods in Reservoirs.

UNIT I **9**

Introduction, fracturing, Stress Distribution, Vertical Versus Horizontal Fractures, Pressure Related to Fracturing, Closure Pressure, Fracturing Pressure –Decline anlaysis, Pressure Interpretation After Closure, Properties of Fracturing Fluids.

UNIT II **9**

Proppants, Propped Fracture Design, Fracture Propagation Model, Width Equations, Material Balance, Detailed Models. Evaluation of Fracture Design.

UNIT III **9**

Acid Fracturing, Acid Systems and Placement Techniques, Fracturing of Deviated and Horizontal Wells, Matrix Stimulations, Matrix Acidizing Design, Rate and Pressure Limits for Matrix Treatment, Fluid Volume Requirments,

UNIT IV **9**

Design and implementation of a multiphase flow reservoir simulator, including interphase mass transfer and variable fluid saturation pressure. Design of compositional reservoir simulators using generalized equation of state. Recent advances in reservoir simulation.

UNIT V **9**

Overview of simulator models and flow conditions. Methods of Solution. Performance Prediction. History match, concept on coning and compositional models. Stimulation Considerations.

TOTAL : 45 PERIODS

TEXTBOOK

1. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.

REFERENCE

1. Petroleum Exploration Hand Book by Moody, G.B.

PE2407 OIL FIELD EQUIPMENT DESIGN DRAWING **L T P C**
0 0 3 3

AIM

Design of the following equipments as per IADC, API, ISME, TEMA, ISI codes and drawing according to scale

OBJECTIVE

Students able to draw

1. Drawing and design of Offshore platform TLP (TENSION LEG PLATFORM) - Fixed platform design,
2. Drawing and design of offshore Jack ups
3. Drawing and design of well equipments]
4. Drawing and design of ROV (remotely operated vehicle)
5. Drawing and design of natural gas storage tank(Horton sphere)
6. Drawing and Designing of Mud tank
7. Drawing and design of on/offshore pipeline.
8. Drawing and design of rotary system in drilling

TOTAL : 45 PERIODS

PE2408 PETROLEUM EQUIPMENT DESIGN LABORATORY L T P C
0 0 3 3

Design of the following equipments as per IADC, API, ISME, TEMA, ISI codes and drawing according to scale:

1. STORAGE VESSELS-VOLATILE AND NON-VOLATILE LIQUIDS CRUDE OIL STORAGE TANKS
2. HEAT EXCHANGERS
3. Drawing and design of double pipe, single pass and multi pass heat exchangers shell and tube heat exchangers.
4. DRILL BITS
5. Drawing and design of drill bits-conical PDC (Poly-diamond-crystalline) bits and its components.
6. BOP
7. Drawing and design of Blow out presenter (BOP).
8. BHA
9. Drawing and design of Bottom-hole-assembly. (BHA) components and assemblies
10. ARTIFICAL LIFT
11. Drawing and design of sucker rod pumping (SRP) unit.
12. WELL BORE DIAGRAM
13. Drawing and design of well bore
14. OIL RIG
15. Drawing and design of land and marine and work-over rig.
16. OFFSHORE PLATFORM
17. Drawing and design of typical Offshore platform
18. PRIME MOVERS
    Drawing and design of oil pumps compressors and turbines.

TOTAL : 45 PERIODS

GE2025 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
1. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

GE2022 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S., "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

PE 2021 MARKETING FUNDAMENTALS L T P C
3 0 0 3

OBJECTIVE

- To understand the various processes involved in Marketing and its Philosophy.
- To learn the Psychology of consumers.
- To formulate strategies for advertising, pricing and selling

UNIT I MARKETING PROCESS 9

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing,organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9

Cultural, demographic factors, motives, types, buying decisions, segmentation factors demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Govindarajan. M, "Marketing management – concepts, cases, challenges and trends", Prentice hall of India, second edition 2007.
2. Philip Kolter,Koshy Jha "Marketing Management", Pearson Education ,Indian adapted edition.2007

REFERENCES

1. Ramasamy and Nama kumari, "Marketing Environment: Planning, implementationand control the Indian context", 1990.
2. Czinkota&Kotabe, "Marketing management", Thomson learning, Indian edition 2007
3. Adrain palmer, " Introduction to marketing theory and practice", Oxford university press IE 2004.
4. Donald S. Tull and Hawkins, "Marketing Reasearch", Prentice Hall of Inida-1997.
5. Philip Kotler and Gary Armstrong "Principles of Marketing" Prentice Hall of India, 2000.
6. Steven J.Skinner, "Marketing", All India Publishers and Distributes Ltd. 1998.
7. Graeme Drummond and John Ensor, Introduction to marketing concepts, Elsevier, Indian Reprint, 2007

PE2023 REFINERY ENGINEERING L T P C
3 0 0 3

UNIT I **9**

Heating of crude oil through exchangers, pipe still heaters, their type and constructional features, Estimation of heat duty, combustion calculation and heat transfer area in different parts in pipe still heater. Calculation of pressure drop and stack height.

UNIT II **9**

Atmospheric distillation, Principles and mode of excess heat removal flash zone calculation and estimation side draw temperatures. Design aspects. Post treatment of straight run products.

UNIT III **9**

Vacuum distillation Column internals and operational aspects for lubes and asphalt's Cracking feed stocks.

UNIT IV **9**

Pressure distillation and gas fractionating units. Difference between various types of distillation Regaining of products of pressure distillations.

UNIT V **9**

Lubrication oils, Specifications, characteristics, Production lube specialties, additives, Refining of lubrication oil-solvent chemical and hydrogenation method dew axing, deasphalting etc. Asphalt and asphalt specialties. Air blowing and emulsification techniques.

TOTAL : 45 PERIODS

TEXT BOOKS

1. B.K.Bhaskar Rao., "Modern Petroleum Refining Processes", 2nd Ed., Oxford and IBH publishing Co. Pvt. Ltd., New Delhi 1990.
2. W.C. Edmister "Applied Hydrocarbon Thermodynamics", Gulf Publishing, Houstan, Texas 1961.

REFERENCES

1. W.L. Nelson, "Petroleum Refinery Engineering", McGraw-Hill, 1964.
2. M.V. Winkle, "Distillation, Chemical Engineering series", McGraw-Hill, 1961.

PE 2024 PETROLEUM TRANSPORTATION ENGINEERING L T P C
3 0 0 3

UNIT I MODES OF CRUDE OIL, PRODUCT AND GAS TRANSPORTATION AND PIPELINE TRANSPORTATION 9

Tank-Trucks and Rail Transportation, Oceanic Tanker Transportation, Inland Water, Coastal and Oceanic, Tanker Size, Power, Cargo Space, Marine Storage Terminals, Shore Installation. Line Specifications, Plastic Pipes.

UNIT II LIQUID TRANSPORT & GAS TRANSPORTATION 9

Crude Oil and Product Flow Characteristics, Transportation of Cryogenic Liquids, Heat Flux Estimation, Temp Gradient in Flowing fluid in Exposed and Buried Pipeline, Insulation Types and thickness, Rheology and Non-Newtonian Behaviour, Stress and Pressure Drop Calculations. Flow Equation, Pressure Drop Calculations. Wey Mouth and Panhandle Equation, Design Factors. Pressure Drop in Non-Horizontal Pipeline. Stress Conditions in Pipeline and Analysis.

UNIT III BRANCHING AND LOOPING IN PIPELINES AND MULTIPHASE FLOW 9

Equivalent Diameter and Length Combined Capacity. Steady State Flow in Pipes, Flow Networks.

Flow pattern in Gas- Liquid Flow, Pressure Drop Estimation, Design Consideration. Pipe Sizing, Storage Capacity, Station Spacing. Transportation Problems and Remedial Measures, Pressure Surges, Scaling, Wax deposition, Gas Hydrate Formation.

UNIT IV PIPELINE PRACTICE AND EQUIPMENT AND SURFACE PROTECTION 9

Route Survey, Transportation, Trenching, Stringing, Bending, Cleaning and Coating, Lowering and Back Filling, Inspection, Testing, Internal Cleaning, Road, Bridge and River Crossing. Welding: Techniques and Equipment

Internal and External Corrosion & Protection, Cathode Protection System.

UNIT V AUXILIARY EQUIPMENT/ FACILITIES AND PUMPS & COMPRESSOR STATION 9

Valves, Regulators, Types and Operating Features. Metering & Storage: Flow Meter Types, Calibration, Proving, Heating Value. Storage of Crude, Product, Natural Gas and LNG.

Layout, Equipment, Instrumentation, Prime Movers: Two stroke vs Four Stroke. Naturally Design Aspirated vs Super Charged Engines, Gas Turbines, Single vs Multi Shaft Turbines, Emission Control.

TOTAL : 45 PERIODS

TEXT BOOKS

1. The Petroleum Shipping Industry: Operations and Practices, Penwell Books, 1996.
2. Introduction to the Oil Pipeline Industry (Oil Pipeline Transportation Practices), he University of Texas at Austin - Petroleum Extension Service; 3rd edition 1984.

PE2025 MAJOR HAZARDS MANAGEMENT L T P C
3 0 0 3

UNIT I **9**

Geology and its perspectives. Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere - Elementary ideas of continental drift and plate tectonics - Evolution of ocean and continental basins.

UNIT II **9**

Ecology, ecosystem and biotic communities, human impact on air, land, soil, water, climate and forest resources - conservation of resources, coping with natural hazards.

UNIT III **9**

Natural Environmental Hazards: Various domains and classes of natural hazards- tropical cyclones, floods, landslides and earthquakes - Prediction control and awareness of earthquakes- volcanic types, distribution and causes - coastal erosion.

UNIT IV **9**

Introduction to Environmental Hazards Management - Global Climate Change: Causes, trends, consequences, and management challenges- Mitigation measures of volcanoes, prevention and controls of landslides.

UNIT V **9**

Environmental degradation and pollution - Air pollution - Water pollution and Soil pollution. Cyclones- types and effects - Droughts- types and factors contribution for drought - Floods- causes and forecast.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Smith, K. Environmental Hazards: Assessing Risk and Reducing Disaster. Third Edition. 2001. Routledge Press.
2. Burton, I, R.W. Kates, and G.F. White, The Environment as Hazard, Second Edition. Guilford Press. 1993.

REFERENCE

1. Godschalk, et. al., Natural Hazard Mitigation: Recasting Disaster Policy and Planning. Island Press. 1999.

PE2026 PETROLEUM CORROSION TECHNOLOGY L T P C
3 0 0 3

AIM

The main of learning corrosion technology is that student will be able to be introduced and understand the basic corrosion problems in oil and gas industry.

OBJECTIVE

- The objective is that student can be able to anlayse the current corrosion problems and control methods in the petroleum industry.

UNIT I **9**

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

UNIT II **9**

Forms of corrosion-uniform-pitting-Galvanic erosion-Intergranualar and weld corrosion, selective Leaching, stress corrosion. Hydrogen embitterment-Fatigue. Role of oxygen in oil filed corrosion-downhole and surface equipment-water flood Removal of oxygen, analysis and criteria for control.

UNIT III **9**

Role of carbon dioxide (CO_2) in corrosion-Effect of temperature and pressure Corrosion of well tubing and other equipments. Role of hydrogen sulphide (H_2S)-Corrosion in downhole, surface, storage and pipelines.

UNIT IV **9**

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

UNIT V **9**

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. "Corrosion control in Petroleum production"-TPC 5-2-nd edition H.G.Byars Houston, texas, 1995.
2. Chemical engineering series, coulson and Richardson, Mc Graw Hill Publications.

REFERENCE

1. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.

PE2030 ADVANCED TOPICS IN GEOPHYSICS **L T P C**
3 0 0 3

UNIT I **9**

Physical Basis of Geophysical exploration – Various surface and sub surface methods and their classifications – Physical Properties of rocks and minerals exploited in exploration and factors that control them Geophysical anomalies

UNIT II **9**

Gravity Prospecting – Principles – Earth Gravitational Field Units – Variations in the Gravitational field – Newton's Law – Geoid , Spheroid and normal gravity field – Absolute and relative measurement of Gravity – Gravimeters and their field operation – Field procedure – Interpretation of Gravity data and Applications of Gravity methods.

UNIT III **9**

Radiometric Prospecting: Fundamentals of radioactivity – Rate of radioactivity decay – Successive disintegration and radioactive equilibrium – Natural radioactive elements – Radio active Series – Nature of radioactive emission – Artificial radioactivity – Radioactivity of rocks. Radiation measuring devices – Processing and Interpretation data – applications of radiometric methods.

UNIT IV **9**

Seismic methods, fundamentals of elasticity – bulk modulus – Poisson's ratio – Elastic Seismic wave theory – Body and surface waves – Primary and Secondary waves – Seismic Instruments - Seismic channels – Applications of Seismic data – Interpretation of field data

UNIT V **9**

Introduction to Well logging techniques – Well conditions – SP and Resistibility logging – Qualitative interpretation of SP and resistibility logs – applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Introduction to Geophysics by Dobrin.
2. Principles of Geophysics by Ramachandran.
3. Quantitative Geophysics and Geology by Louis Lliboutry.

REFERENCE

1. Principles of applied Geophysics by D.S. Paranis

PE2032 ADVANCED DRILLING ENGINEERING **L T P C**
3 0 0 3

UNIT I

Drilling and Well Servicing structures – Definitions – Design specifications – Maintenance and use of Drilling and wall servicing structures.

UNIT II

Hoisting Systems - -Design – Rating and Testing – Inspections – Supplementary and Requirements – Manufacture and Tolerances

UNIT III

Rotary Equipments - Swivel and Rotary Hose – Rotary Table and Bushing - Bits and Down hole tools.

UNIT IV

Mud Pumps – Pump installations – Pump operations – Drilling Muds and Completion fluids – Suspended solids and Transport Cuttings – Nonaqueous fluids – Oil base and synthetic – Base muds – Drilling fluids activities – Clay chemistry

UNIT V

Drill strings – compositions and design – Drill Collar – Drill Pipe – Tools Joints –Drill String Design.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.
2. Rabia.H. 'Oil Well Drilling Engineering, Principles And Practices' Graham And Trotman Ltd. 1985.

REFERENCE

1. Mc.Cray. A.W and Cole.F.W. 'Oil Well Drilling Technology' University of Oklahoma Press, Norman 1959.

PE2033 WELL COMPLETION AND SIMULATION L T P C
3 0 0 3

UNIT I **9**

Well Design: Prediction of formation pore pressure and stress gradients. Determination of safety mud weight bounds for different in-situ stress conditions. Design and planning well trajectory. Surveying tools and methods.

UNIT II **9**

Design of drill string including bottom hole (BHA) assembly. Drilling methods and equipment for directional, horizonatal and multilateral wells. Selection of casing shoes, material properties and design of casing program.

UNIT III **9**

Well Completion and Stimulation: Well completion design, types of completion, completion selection and design criteria. Interval selection and productivity Considerations: effects of producing mechanisms. Inflows performance and multiple tubing performance analyses using commercial software.

UNIT IV **9**

Well stimulation and work over planning. Tubing-packer m0ovement and forces. Tubing design: graphical tubing design and simplified tensional strength design. Selection of down hole equipment, tubing accessories and wellhead equipment.

UNIT V **9**

Basic of perforation, selection of equipment and procedure for perforation oil and gas wells. Technology of sand control: gravel packing. Fundamentals of well stimulation technologies: acidisation and hydraulic fracturing.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Standard Handbook of Petroleum and Natural Gas Engineering. 2nd Edition. William C Lyons, Gary C Plisga. Gulf Professional Publishing.
2. Wellsite Geological Techniques for petroleum Exploration by Sahay.B et al.

REFERENCE

1. Petroleum Exploration Hand Book by Moody, G.B.

PE2034 RISK ASSESSMENT AND SAFETY ENGINEERING L T P C
3 0 0 3

UNIT I **9**

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 II **9**

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

UNIT III **9**

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 IV **9**

Safety in plant design and layout – Safety provisions in the factory act 1948 – Indian explosive act 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 V **9**

Risk Management & Iso14000: Overall risk analysis - Generation of Meteorological data - Ignition data - Population data. Overall risk analysis – E and FI model— Disaster management plan – Emergency planning – Onsite and offsite emergency planning – Risk management – Gas processing complex, refinery – First aids.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Blake, R.P., “Industrial Safety”, Prentice Hall, 1953.
2. Lees, F.P., “Loss Prevention in Process Industries”, 2nd Edition, Butterworth Heinemann,1996.
3. K. V. Raghavan and A A. Khan, “Methodologies in Hazard Identification and Risk Assessment”, Manual by CLRI, 1990.
4. V. C. Marshal, “Major Chemical Hazards”, Ellis Horwood Ltd., Chichester, United Kingdom. 1987.

REFERENCES

1. Geoff Wells, “Hazard Identification and Risk Assessment”, I.ChE.,John Ridley and John Channing, “Safety at Work”, 6th Edition. Butterworth-Heinemann, 2003.
2. “A Guide to Hazard Operability Studies”, Chemical Industry Safety and Health Council, 1977.

PE 2035 STORAGE AND TRANSPORTATION OF CRUDE OIL AND NATURAL GAS **L T P C 3 0 0 3**

UNIT I INTRODUCTION **9**

Crude oil Trade, Selection of Port Location, Ship Building/Shipyards.

UNIT II NATURAL GAS REGASIFICATION TECHNOLOGY **9**

Commercial Sourcing of Natural Gas, Different Kinds of Regasification Techniques, Regasification Process & Cold Utilization, Synchronization of Degasified gas and Pipelines, Current Status in India

UNIT III CRUDE OIL TRANSPORTATION **9**

Transportation techniques of crude oil, Pipeline specification, Corrosion Prevention techniques, Pressure drop, Pumps and Booster station, Wax deposition and prevention, Chemical treatment

UNIT IV DESIGN **9**

Basic Engineering Aspects of Terminal Design, Design of Liquefaction Train, Ship Building/Shipyards, Storage Facilities

UNIT V CHARTERTICS OF STORAGE **9**

Supply & Demand, Variation Gas Field & Aquifers, Technical Qualities and Storage, Properties of Storage Reservoir, Rocks & Fluids.

Flow through Storage Reservoir; Inventory Concept, Pressure- Content Hysteresis, Inventory Verification, Gas Flow Performance, Gas Deliverability.

Design & Development of Underground Storage Fields: Operation of Storage Fields. Threshold Pressure. Water Influx/Efflux Quantities. Aquifer Equilibrium Pressure. Error and Uncertainty.

Gas Storage in Salt Cavity & Caverns: Thermodynamics, Temperature and Pressure Effect. Recent Developments

Advanced Storage Techniques, Case Histories.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Oilfield Processing: Crude Oil (Oilfield Processing of Petroleum R. Solvay, Pennwell Books 1995.
2. Advances in Environmental Control Technology: Storage Tank Paul Cheremisinoff Gulf Professional Publishing; 1ST edition (May 9, 1996

PE2036 COMPUTER AIDED PROCESS PLANT DESIGN **L T P C 3 0 0 3**

UNIT I **9**

Introduction to process plant design - Properties Evaluation: Spread sheeting, Hierarchy of Process Design and the Onion model - Flow sheeting - Typical units of CAD system - Process synthesis - Physical properties evaluation –Transport properties & thermodynamic properties of gases and binary mixtures.

UNIT II **9**

Basic Model Development For Preliminary Systems: Methods of calculating vapor liquid equilibrium data for ideal and non-ideal mixtures - Bubble point and Dew point - Flash and distillation calculations - Equipment design - Development of software programmes for the following systems - Piping system, single phase & two phase.

UNIT III **9**

Cad Model For Fluid Moving Machinery & Storage Design: Separator system - Two phase and three phase - Storage system - Atmospheric, pressurized & cryogenic.

UNIT IV **9**

Cad Model For Heat Transfer Equipment Design: Double pipe - Shell and tube heat exchanger - PHE - Air cooler - Heat integration of evaporators.

UNIT V **9**

Cad Model For Mass Transfer Equipment And Safety Devices Design: Binary mixtures - Pseudo binary - Multistage distillation system - Heat integration of distillation columns - Absorber and strippers - Liquid-liquid extractors - Safety devices-pressure safety valve & flare system

TOTAL : 45 PERIODS

TEXT BOOKS

1. B.C. Bhattacharyya and C.M. Narayanan, “Computer Aided Design of Chemical Process Equipment", Ist Edn., New Central Book Agency (P) Ltd., New Delhi, 1992.
2. James M. Douglas “Conceptual Design of Chemical Processes”, McGraw Hill, New York, 1981.

REFERENCES

1. Hussein, "Chemical Process Simulation", Wiley Eastern, 1986.
2. A.K. Coker, “FORTRAN Programme for Chemical Process Design, Analysis and Simulation”, Gulf Publishing Co., 1995.

PE2037 **BIO-CHEMICAL ENGINEERING** **L T P C**
3 0 0 3

UNIT I **9**

Introduction to biochemical process industries. Industrial alcohols, antibiotics, acids, alcoholic beverages, enzymes, vitamins, single cell protein. Food processing and biological waste treatment. Interaction of chemical engineering principles with biological sciences.

UNIT II **9**

Life processes, unit of living system, microbiology, reaction in living systems, biocatalysts, model reactions. Fermentation mechanisms and kinetics: Kinetic models of microbial growth and product formation Fermenter types.

UNIT III **9**

Modeling of batch and continuous fermentor. Bioreactor design, mixing phenomena in bioreactors. Sterilization of media and air, sterilization equipment, batch and continuous sterilize design.

UNIT IV **9**

Biochemical product recovery and separation. Membrane separation process: reserve osmosis, dialysis, ultra filtration; Chromatographic methods: adsorption chromatography, gel filtration affinity chromatography etc.

UNIT V **9**

Electro-kinetic separation: electro-dialysis, electrophoresis. Waste water treatment: activated sludge process, anaerobic digestion, and trickling filter.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Biochemical engineering, Bailey, Tata Mc Graw hill publications.
2. Chemical engineering series, coulson and Richardson, Mc Graw Hill Publications.

PE2038 CHEMICAL KINETICS AND REACTOR DESIGN **L T P C**
3 0 0 3

UNIT I **9**

Analysis of Noncatalytic fluid solid reaction: Kinetics of non-catalytic fluid-particle reactions, various models, application to design.

UNIT II **9**

Catalyst preparation and characterization: Catalysis - Nature of catalyses, methods of evaluation of catalysis, factors affecting the choice of catalysts, promoters, inhibitors, and supports, catalyst specifications, preparation and characterization of catalysts, surface area measurement by BET method, pore size distribution, catalyst, poison, mechanism and kinetics of catalyst, deactivation.

UNIT III **9**

Physical adsorption and chemical adsorption: Fluid-fluid reactions different regimes, identification reaction regime, application to design. Physical absorption with chemical reaction, simultaneous absorption of two reacting cases consecutive reversible reactions between gas and liquid, irreversible reactions, estimation of effective interfacial area in absorption equipment.

UNIT IV **9**

Reaction kinetics, accounting porous nature of catalyst: Heterogeneous catalytic reactions - effectiveness factor, internal and external transport processes, non-isothermal reacting systems, uniqueness and multiplicity of steady states, stability analysis.

UNIT V **9**

Modeling of chemical reactors: Modeling of multiphase reactors - Fixed, fluidized, trickle bed, and slurry reactors.

TOTAL : 45 PERIODS

TEXT BOOKS

1. G.F. Froment, K.B. Bischoff, "Chemical Reactor Analysis and Design", 2nd ed., John Wiley, New York, 1990.
2. O. Levenspiel, "Chemical Reaction Engineering", 3rd edition, Wiley Singapore, 2000.

REFERENCES

1. J.J. Carberry “Chemical and Catalytic Reaction Engineering", McGraw Hill, New York, 1976.
2. R. Aris, "Elementary Chemical Reactor Analysis", Prentice Hall, 1969.

PE2039 **PRINCIPLES OF GEOCHEMISTRY** **L T P C**
3 0 0 3

UNIT I **9**

Earth in relation to Universe – Nature, age, and Composition of Universe, Nature, Age and Composition of Sun, Basic Principles of Geochemistry – Geochemical environment – Geochemical dispersion – Geochemical Mobility – Mineral stability – Trace Elements in Minerals – Goldschmidt's Classifications – Geochemical Tracers – Geochemical anomaly – Primary Differentiation of the Earth.

UNIT II **9**

Principles of trace element analysis - Preparation, decomposition and separation of samples – Estimation of trace elements in Samples - Gravimetry – colorimetry – Turbidity – Spot Tests – Paper chromatography – Visible Fluorescence – Flame Spectrometry – X-Ray spectrometry – Geochemcial Provinces –

UNIT III **9**

Secondary Dispersion: Chemical and biochemical factors – Hydrogen ion concentrations – Redox stability of secondary minerals – Mode of occurrence of solute – Sorptive capacity of solids – Stability of colloidal dispersion – Metallo – Organic Compounds - Effects of Vegetation

UNIT IV **9**

Anomalies in Natural waters : Mode of occurrence of elements – persistence of anomaly – contrast at source – Decay by dilution – Decay on precipitation – ground water, seawater and lake water anomalies

UNIT V **9**

Geochemical Soil surveys, orientation survey – Residual soil, Transported Soil, Contaminations – Sampling Patterns and procedures – Sample preparations – Preparation and Interpretations of Geochemical Maps.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Mason, B. and Moore, C.B., 1991, Introduction to Geochemistry, Wiley Eastern.
2. Faure, G., 1986, Principles of isotope Geology., John Wiley.

REFERENCES

1. Hoefs, J., 1980, Stable Isotope Geochemistry., Springer Verlag
2. Krauskopf, K.B., 1967, Introduction to geochemistry, McGraw Hill.