School of Ocean Engineering

Department of Petroleum Engineering
B.Tech. PetroleumEngineering

Programme Outcome of B.E / B.Tech Programme:

PO1- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 - The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO -10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES- B.Tech Petroleum Engineering

To enable the student to emerge with:

PSO-1: An ability to apply knowledge of mathematics, science, and engineering.

PSO-2: Ability to design and conduct experiments, as well as to analyze and interpret data

PSO-3: Be proficient in mathematics through differential equations, probability and statistics, fluid mechanics, strength of materials, and thermodynamics.

PSO-4: Design and analysis of well systems and procedures for drilling and completing wells.

PSO-5: Characterization and evaluation of subsurface geological formations and their resources using geo scientific and engineering methods.

PSO-6: Application of reservoir engineering principles and practices for optimizing resource development and management.

PSO-7: Be proficient in petroleum sub disciplines including drilling, production, reservoir and formation evaluation.

PSO-8: Get hand on experience with Geosciences including geology and geophysics.

PSO-9: The broad education necessary to understand the impact of engineering solutions in a global societal content.

PSO-10: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

VELS UNIVERSITY

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)

NAAC ACCREDITED

PALLAVARAM - CHENNAI - INDIA

B.Tech. PetroleumEngineering

Curriculum and Syllabus

(Based on Choice Based Credit System)
Effective from the Academic year
2015-2016
(Modified Version)

Department of Petroleum Engineering
School of Ocean Engineering

VELS UNIVERSITY, SCHOOL OF OCEAN ENGINEERING
Programme: B.Tech -PETROLEUM ENGINEERING
CURRICULUM

Total Number of Credits:200

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER – I					
Core	15EPE001	Engineering Mathematics – I	3	1	0	3
Core	15EPE002	Engineering Physics-I	3	0	0	3
Core	15EPE003	Engineering Chemistry	3	0	0	3
Core	15EPE004	Basic Electrical and Electronics Engineering	3	0	0	3
Core	15EPE005	Basics of Computers & utilities	3	0	0	3
Core	15EPE006	Computer Practical Lab	0	0	2	1
Core	15EPE007	Engineering Graphics Lab	0	1	2	2
Core	15EPE008	Workshop Practice-I	0	0	3	2
AECC	15EPE201	English for Engineers-I (AECC-I)	2	1	0	3
AECC	15EPE202	Environmental Science (AECC-II)	3	0	0	2
		Total	**20**	**3**	**7**	**25**

VELS UNIVERSITY, SCHOOL OF OCEAN ENGINEERING

B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER – II					
Core	15EPE009	Engineering Mathematics – II	3	0	0	3
Core	15EPE010	Engineering Physics-II	3	0	0	3
Core	15EPE011	Engineering Mechanics	3	0	0	3
Core	15EPE012	Material Science	3	0	0	3
Core	15EPE013	C Programming & Language	3	0	0	3
Core	15EPE014	C Programming Practical	0	0	2	1
Core	15EPE015	Physics Lab	0	0	2	1
Core	15EPE016	Chemistry Lab	0	0	2	1
Core	15EPE017	Electrical & Electronics Engineering Lab	0	0	2	1
Core	15EPE018	Workshop Practice-2	0	0	3	2
AECC	15EPE203	English for Engineers – II(AECC-III)	2	0	0	3
SEC	15EPE----	SEC-I (Skill Enhancement Course)	1	0	1	1
		Total	**18**	**0**	**12**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER – III					
Core	15EPE019	Engineering Mathematics III	3	1	0	4
Core	15EPE020	Principles of Petroleum Engineering	3	1	0	4
Core	15EPE021	Petroleum Geology	3	0	0	3
Core	15EPE022	Petroleum Geophysics & Geochemistry	3	0	0	3
Core	15EPE023	Fluid Mechanics	3	0	0	3
Core	15EPE024	Electronics & Instrumentation	3	0	0	3
Core	15EPE025	Geology Practical	0	0	2	1
Core	15EPE026	Fluid Mechanics Practical	0	0	2	1
Core	15EPE027	Electronics & Instrumentation Practical	0	0	2	1
Core	15EPE028	Engineering Mechanics Lab	0	0	2	1
SEC	15EPE----	SEC-II	0	0	2	1
		Total	**18**	**2**	**10**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER – IV					
Core	15EPE029	Engineering Mathematics – IV	3	1	0	3
Core	15EPE030	Reservoir Engineering I	3	0	0	3
Core	15EPE031	Petroleum Thermodynamics	3	0	0	3
Core	15EPE032	Drilling operations &equipments	3	0	0	3
Core	15EPE033	Drilling Fluids & Cement	3	0	0	3
Core	15EPE034	Formation Evaluation & Well Logging	3	0	0	3
Core	15EPE035	Natural Gas Engineering	3	0	0	3
Core	15EPE036	Drilling Fluids and Cementing Lab	0	0	2	1
Core	15EPE037	Thermal Engineering Lab	0	0	2	1
Core	15EPE038	Core Analysis Lab	0	0	2	1
SEC	15EPE----	SEC-III	0	0	2	1
		Total	**21**	**1**	**8**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER –V					
Core	15EPE039	Reservoir Engineering II	3	1	0	4
Core	15EPE040	Production equipments& operation	3	0	0	3
Core	15EPE041	Well Testing	3	1	0	4
Core	15EPE042	Hydrocarbon Processing & Plant Engineering	3	0	0	3
Core	15EPE043	Heat & Mass Transfer	3	0	0	3
Core	15EPE044	Linear and Numerical Programme	3	0	0	3
Core	15EPE045	Reservoir Engineering Lab	0	0	2	1
Core	15EPE046	Petroleum Testing Lab	0	0	2	1
Core	15EPE047	Heat & Mass Transfer Practical	1	0	2	2
DSE	15EPE----	Discipline Specific Elective (DSE-I)	3	0	0	3
		Total	**22**	**2**	**6**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER –VI					
Core	15EPE048	Reservoir Modeling, Simulation & Management	3	0	0	3
Core	15EPE049	Enhanced Oil Recovery & Water flooding	3	0	0	3
Core	15EPE050	Pipeline Engineering	3	0	0	3
Core	15EPE051	Petrochemicals & Petroleum Refining	3	0	0	3
Core	15EPE052	HSE & Hazards Management	3	0	0	3
Core	15EPE053	Well Design & Completions	3	0	0	3
Core	15EPE054	Reservoir Modeling Lab	0	0	2	1
Core	15EPE055	Minor Project (Casing and Well Design)	0	0	2	1
Core	15EPE056	Standards of Training, Certification and Watch-keeping (STCW)	0	0	2	0
DSE	15EPE----	Discipline Specific Elective (DSE-II)	3	0	0	3
GE	15EPE----	Generic Elective (GE-1)	3	0	0	2
		Total	**24**	**0**	**6**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER –VII					
Core	15EPE057	Petroleum Economics	3	0	0	3
Core	15EPE058	Offshore Drilling & Production	3	0	0	3
Core	15EPE059	Unconventional Hydrocarbon resources	3	0	0	3
Core	15EPE060	Production Chemicals & oil field chemistry	3	0	0	3
Core	15EPE061	Well Service s & Stimulation Techniques	3	0	0	3
Core	15EPE062	Field Development Plan	3	0	0	3
Core	15EPE063	AutoCAD	0	0	2	2
Core	15EPE064	Major Project-Phase-I	0	0	2	0
DSE	15EPE----	Discipline Specific Elective (DSE-III)	3	0	0	3
GE	15EPE----	Generic Elective (GE-II)	3	0	0	2
		Total	**24**	**0**	**4**	**25**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING

Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
	SEMESTER –VIII					
Core	15EPE065	Petroleum Storage, Transportation & Marketing	3	0	0	3
Core	15EPE066	Major Project-Phase-II	0	0	*17	15
Core	15EPE067	Project Presentation& Viva voce	0	0	4	2
DSE	15EPE----	Discipline Specific Elective (DSE-IV)	3	0	0	3
GE	15EPE----	Generic Elective (GE-III)	3	0	0	2
		Total	**9**	**0**	**21**	**25**

***Students will be working on the project during the non class hours also.**

VELS UNIVERSITY - SCHOOL OF OCEAN ENGINEERING
B.TECH -PETROLEUM ENGINEERING
COURSE STRUCTURE UNDER CREDIT BASED CHOICE SYSTEM (CBCS)
APPLICABLE FROM 2015 - 2016 ACADEMIC YEAR ONWARDS

List ofDiscipline Specific Elective Courses

15EPE101	Petroleum Chemistry
15EPE102	Advanced Offshore Engineering
15EPE103	Reservoir Rocks & Fluids
15EPE104	Introduction to Marine Engineering
15EPE105	Elements of Reservoir Engineering
15EPE106	Process Instrumentation Dynamics and Control
15EPE107	Multi-component Distillation
15EPE108	Surveying
15EPE110	Petroleum Transport Phenomena
15EPE109	Reservoir Fluid Thermodynamics

List of Generic Elective Courses

15EPE151	Statistics andLinear Programming
15EPE152	Equilibrium Staged Operations
15EPE153	Marine Electrical Technology
15EPE154	EnergyTechnology
15EPE155	Professional Ethics
15EPE156	SupplyChainManagement
15EPE157	Total Quality Management

List of Ability Enhancement Compulsory Courses (AECC)

15EPE201	English for Engineers I
15EPE202	Environmental Science
15EPE203	English for Engineers II

List OfSkill Enhancement Courses (SEC)

15EPE251	Personality Development
15EPE252	National Services Scheme
15EPE253	Soft Skill

SYLLABUS
CORE COURSES

15EPE001 Engineering Mathematics–I 3 1 0 3

Course Objectives: To develop the students' ability in engineering mathematics such as trigonometry, Hyperbolic functions, differential calculus, Cartesian and polar form, and integral calculus in order to solve problems related to ship and offshore structure design.

Unit I Trigonometry **9**

De Movier's Theorem and its applications - Expansion of Sin nθ, cosnθ, and Sin^n θ, cos^n θ. Hyperbolic functions - Separation into real parts and imaginary Parts - simple problems. Summation of series using C + is method.

Unit II Differential Calculus I **9**

Successive Differentiation of Standard forms -Leibnitz's theorem (Statementonly)- simple problems. Length of Sub tangent and Subnormal.Tangentandnormal in Cartesian and polar form.Curvature, radius and centre of curvature in Cartesian and polar form - Evolutes and Envelopes.

Unit III Differential Calculus II **9**

Functions of two variables - Partial derivatives - Euler's theorem on homogeneous functions and its generalization - total differentialsJacobian- Taylor's series in the case of two variables - Maxima /Minima of Two variables - Lagrange's method of undetermined multipliers.

Unit IV Integral Calculus I **9**

Integration by trigonometric substitution, by parts, Bernoulli's rule.Reduction formulae - Properties of definite integrals - beta and gamma Functions and problems.Integral as the limit of a sum. Curve tracing. Areas of curves.Volume of curves.

Unit V Integral Calculus II **9**

Operations under the sign of integration - multiple integrals - change of order of integration - Transformation of coordinates -Area, Volume and Surface area of solids using multiple integrals.

Total hours: 45

COURSE OUTCOMES:

CO-1: To develop the use of matrix algebra techniques this is needed by engineers for practical applications.

CO-2: Identify various types of matrices, add, subtract and multiply matrices, compute the rank of a matrix.

CO-3: Solve system of equations and use matrices and determinants.

CO-4: To make the student acquire sound knowledge of techniques in solving analytical geometry that model engineering problems.

CO-5: To derive the Plane equation, structure equation of Right Circular Cone & Cylinder.

CO-6: Understanding the ideas of differential calculus and facility in solving simple standard examples like radius of curvature, circle of curvature.

CO-7: Evolutes, Envelopes and their Normal.

CO-8: To familiarize the student with functions of several variables. This is needed in many branches of engineering.

CO-9: To make the functions of maxima and minima values.

CO-10:To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

TEXT BOOKS

1. Dr. B.S.Grewal, "Higher Engineering Mathematics", 40th edition, Khanna Publishers, New Delhi, 2007
2. Kandasamy, P.ThilagavathyandGunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.
3. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCE BOOKS

1. H.K.Dass, "Engineering Mathematics", S. Chand Publishers, New Delhi, 2008
2. Narayanan, S., ManicavachagomPillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

15EPE002 Engineering Physics-I 3 0 0 3

Course Objectives: To develop the students' ability in engineering physics such as mechanics and properties of matter, Heat ant Thermodynamics, Sound and waves, Optics and Conducting material in order to gain sound knowledge to petroleum related problems.

Unit I Mechanics and Properties of Matter **9**

Newton's laws of motion-principle of conservation of linear momentum-angular momentum-relation between force and torque-moment of Inertia and radius of gyration-physical significance of M.O.I.-elasticity-modulus of elasticity- Poisson's ratio-shear-shear angle-couple per unit twist for a uniform cylinder and hollow cylinder-bending moment restoring couple –uniform bending- "I "form of girders-basic ideas of surface tension and viscosity.

Unit II Heat and Thermodynamics **9**

Kinetic theory of gases-postulates-expression for the pressure of a gas-root mean square velocity-perfect gas equation-kinetic energy of a molecule-mean free path behavior of real gas-Andrew's isothermal-Vanderwaals equation-triple point –basic idea of statistical physics-quantum statistics-first and second law of thermodynamics-Carnot's engine efficiency-reversibility-entropy.

Unit III Sound and Waves **9**

Classification of sound-progressive wave –stationery waves-forced vibration and resonance-characteristic of musical sound-loudness-Weber-fecher law-Decibel-absorption coefficient-reverberation time-Sabine's formula (growth and decay)- factors affecting acoustics of building(reverberation time,loudness,focusing,eco,echelon effect, resonance and noise) and their remedies.

Unit IV Optics **9**

Luminous flux-intensity of illumination-Lamber's cosine law-intensity of light required for a class, operation theatre and a hall-velocity of light-Michelson method-introduction to wave theory-interference-Michelson interferometer-type of fringes determination of wavelength-thickness of thin transparent sheet-introduction to diffraction-resolving power-Rayleigh's criteria-expression for intensity of plane, circularly and elliptically polarized light-photo elasticity-birefringence-stress-optic law effect of stressed model in a polariscope-isoclinic and isochromatic fringes-photo elastic bench.

Unit V Conducting material **9**

Conduction in metals-mobility and conductivity-classical free electron theory of metals-electrical conductivity-thermal conductivity-Weidmann Franz law-Lorentz number-draw backs of classical theory-band theory of solid-classification of solids into metals, semiconductors and insulators on the basis of band theory-Fermi distribution function function-density of energy states-carrier concentration in metals-energy distribution of electrons-calculation of density of holes and electrons.

Total hours: 45

COURSE OUTCOMES:

CO-1: Understand the difference between solids, liquids, and gases.

CO-2: Impart the knowledge about the dynamics of rigid bodies

CO-3: Understand heat as a form energy transfer.

CO-4: State the first law of thermodynamics and understand its implications.

CO-5: Learn to recognize interference of sound waves including the phenomenon of beats.

CO-6: Define diffraction and gain an understanding of its occurrences.

CO-7: Apply advanced tools to characterize and improve the performance of sound reproduction and reinforcement systems.

CO-8: Analyze acoustic properties of typically used materials for design consideration.

CO-9: Apply the basic concepts of Fermi distribution function in energy bands of solids.

CO-10: Determine the electrical and thermal conductivity of the metals

TEXT BOOKS

1. A Marikani, “Engineering Physics”, PHI Learning Private Limited, 2nd edition, 2013.
2. G Vijayakumari, “Engineering Physics”, Vikas Publishing House PVT LTD, 7th edition, 2013.

REFERENCE BOOKS

1. Dr. Mani p, “Engineering Physics”, Dhanam Publications, Chennai-42.
2. Pilli S.O. “Solid State Physics”, New Age International Publication, New Delhi, fifth Edition, 2003.
3. Palanisamy P.K., “Physics for engineers”, Scitech Publications (India) pvt Ltd., Chennai, second Edition, 2005.
4. ArumugamM.,”Engineering physics”, Anuradha Agencies, Kumbakonam, Second Edition, 2005.
5. Avadhanulu M.N. and Kshirsagar P.G., “ A Text Book of Engineering Physics”.S.Chand& Company Ltd, 7 th Enlarged Revised Ed., 2005.

15EPE003 Engineering Chemistry 3 0 0 3

Course Objectives: To develop the students' ability in engineering chemistry in areas such as water and its treatment, fuels and combustion, lubricants, electrochemistry in order to gain sound knowledge to understand the components and properties of petroleum

Unit I Water and Its Treatment **10**

Sources of water, hard and soft water, types of hardness, determination of hardness by EDTA method, softening of water- external conditioning - lime soda process, zeolite process, ion exchange process, internal conditioning. Alkalinity – type of alkalinity, determination of alkalinity. Boiler feed water requirements. Boiler problems-scales and sludge, priming and foaming, caustic embrittlement,corrosion.PHASE RULE- Terminology, simple examples of one component (water), condensed phase rule, binary alloy system

Unit II Fuels and Combustion **10**

Classification and properties of fuel, calorific value determination using bomb calorimeter. Solid fuels-Analysis - proximate and ultimate analysis, hydrogenation and carbonization of coal.Liquid fuels- Outline of petroleum processing, characterization of various constituents vizPetrol diesel with regard to their application in IC engines, Petrol and diesel knocking, refining and reforming, octane and cetane number.Gaseous fuels – Coal gas, producer gas, biogas, water gas analysis using orsat apparatus.

Unit III Lubricants **6**

Mechanism of lubrication, greases or semi-solid lubricants, solid lubricants, synthetic lubricants, lubricating emulsions, properties of greases, cutting fluids, selection of lubricants, classification and properties of lubricating oils (viscosity, flash and fire point and cloud and pour points).

Unit IV Electrochemistry **8**

Conductance of electrolytes and its measurements, application of conductance, Measurements- conductometric titrations, theory of strong electrolytes, kohlraushs law, ostwalds dilution law, common ion effect, theory of indicators, pH of a buffer solution.Electrodes, standard and single electrode potential, electrochemical series, Nernst Equations, cell terminology, cell reactions galvanic cells, fuel cells, lead acid battery.Introduction to CORROSION SCIENCE. Chemical and electrochemical corrosion, types of corrosion, general methods of prevention and control of corrosion, sacrificial anode method, paints, varnishes and enamels, metallic coatings, hot dipping, galvanizing, electroplating.

Unit V Production of Engineering Materials **11**

Production of steel- Bessemer converter process, open hearth process, Chemicaladditiontosteels, heat treatment of steel. Production of non ferrous alloys - aluminium and its alloys, brass bronze, special reference to ship building (ship propellers etc), Inorganic engineering materials - cement manufacture, composition, setting and hardening, Nomenclature of polymers, types of polymerization, mechanism of addition, Polymerization, thermosetting and thermoplastics, engineering plastics - nylon plastics, ethylene plastics, Bakelite, fabrication of plastics, production of GRP material.

Total hours: 45

COURSE OUTCOMES:

After studying this topic, students will be able to

CO-1: To know about characteristics of water and estimation of hardness using EDTA Titration

CO-2: Determine alkalinity and its types of alkalinity using neutralisation reaction

CO-3: To know about the classification and properties of fuel, calorific value determination using bomb calorimeter

CO-4: Distinguish between Daniel cell, Voltaic cell, batteries etc.

CO-5: Define Petrol and diesel knocking, refining and reforming, octane and cetane number.

CO-6: Define polymers, Classifications of polymers and its synthetic applications.

CO-7: Distinguish between Chemical and Electrochemical Corrosion and method of prevention

CO-8: Gain knowledge about different sources of energy and types of batteries

CO-9: Understand the nomenclature of polymers, types of polymerization, mechanism of addition, Polymerization, thermosetting and thermoplastics.

TEXT BOOKS

1. Dr. V. Balasubramaniam, Dr. Sreedevi, Dr. G. Ramachandran, Engineering Chemistry, CARS Publishers, West Mambalam, Chennai-33, 2010.
2. Jain & Jain, “Engineering chemistry”, DhanpatRai Publishing Company, New Delhi, 13th edition, 2001.

REFERENCE BOOKS

1. Balasubramaniam M.R., KrishnamoorthyS&Murugesan,” Engineering chemistry” Allied publishers
2. M.M.Uppal , “A textbook of engineering chemistry” Khanna publishers.
3. Goyal R. N. &Goyal H., Textbook Of Engineering Chemistry, 2nd Edition, Ane Books private Ltd

15EPE004 Basic Electrical and Electronics Engineering 3 0 0 3

Course Objectives: To understand basics of electrical engineering and the fundamentals to develop and understand ship board electrical systems which will be useful for the student to design the electrical systems.

UNIT I Introduction **9**

Importance of electrical elements in day today life, Electrical Elements and their classification, Kirchoff"sCurrent Law and kirchoff's voltage Lawand equations - Loop current method and node voltage method. .

UNIT II D.C. Circuits **9**

Steady state analysis with independent and dependent sources Series and parallel circuits, Star-delta conversion, Superposition theorem, Thevenin'stheorem, Maximum Power Transfer Theorem.

UNIT III A.C. Circuits **9**

A.C. Single-phase Circuits Common signals and their waveform, RMS and Average value, form factor & peak factor of sinusoidal waveform Impedance of series and parallel circuits. Phasor diagram Power, power factor, power triangle, coupled circuits, Resonance and Q-factor.

UNIT IV Three phase circuits **9**

Three phase Circuits; star - delta, line and phase relation, power relations, analysis of balanced and unbalanced -Three phase circuits.Superosition.Thevenin's and Norton's Maximum PowerTransfer Theorem for A.C circuits.

UNIT V Magnetic Circuits **9**

Magnetic Circuits Introduction, Series-parallel magnetic circuits, Analysis of Linear and non-linear magnetic circuits, Energy storage, A.Cexcitation, Eddy currents and hysteresis losses.Introduction to Ship Board Electrical Machinery & systems.

Total hours: 45

COURSE OUTCOMES:

CO-1: To predict the behavior of any electrical and magnetic circuits.

CO-2: To identify the type of electrical machine used for that particular application.

CO-3: To wire any circuit depending upon the requirement.

CO-4: To impart the basic knowledge about the Electric and Magnetic circuits.

CO-5: To inculcate the understanding about the AC fundamentals.

CO-6: To understand the working of various Electrical Machines.

CO-7: To know about various measuring instruments and house wiring

TEXT BOOKS

1. V.K. Mehta &Rohit Mehta, Basic Electrical engineering, S Chand
2. I. J. Nagrath, Basic Electrical Engineering, 2nd edition, Tata McGraw Hill.

REFERENCE BOOKS

1. Arthur Eugene Fitzgerald, David E. Higginbotham, Arvin Grabel, Basic Electrical Engineering, 1981, McGraw-Hill
2. Mittle&Mittal , Basic Electrical Engineering, 2nd Edition, Tata McGraw Hill Publishing Company

15EPE005 Basics of Computers & Utilities 3 0 0 3

Course Objectives: To understand fundamental concepts of computer which will help students to develop their ability in pipe lying and offshore structure design.which the student will be using later in the design offices are all based on the computer basics.

Unit I Introduction to Computer **9**

Block Diagram of Digital Computers and its functions, Classification of computers-Micro computer, Mini computer, Mainframe computer and Super computer. Peripheral devices like printers (laser, ink jet and dot matrix), monitors and keyboards.

Unit II Input Outputdevices **9**

External Storage devices.The software (Operating Systems, Utility programs, Application Programs, Languages etc). Input-joysticks, touch screens, microphones, barcode readers. Output-plotters, speakers, control devices.

Unit III Fundamentals of Computer Concept **9**

Bit – Byte, Decimal Number system, Octal Number system, Hexa decimal Number SystemConversions, Program Language generations, Data - Record - File- Database, Master file - Transaction File - Work File - Backup File, Types of file organizations (Sequential, Index & Direct)

Unit IV Operating System **9**

Introduction - Types of OS, Functions of OS - Processor Management, Memory Management- Device Management, Information Management – Compiler, Assembler - Interpreter - Loader and Linker.

Unit V Internet and web Technologies **9**

Internet: Networking Concepts an Over View - Evolution of InternetWorking of Internet (DNS, IP Address, Word Address, DialUp Connection, Dedicated Line Connection, ISDN, E-Mail and Browsers) Applications of Computer.

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the characteristics, classification and evolution of computers.

CO-2: To learn the generation of computers and their architecture.

CO-3: To be well versed in Numbers Systems and their conversions.

CO-4: To determine the advantages and limitations of algorithm, flowchart and pseudocode.

CO-5: To explain the features of application software packages and evolution of internet.

CO-6: To develop programs using various control instructions and operator precedence in C programming.

CO-7: To handle string manipulations, array and functions for various applications using C programming constructs.

CO-8: To analyze the merits of pointers in C.

CO-9: To understand the difference in memory allocation while using structure and union in C programming.

CO-10: To learn the various file operations in C.

TEXT BOOKS

1. Chanchal Mittal, Foundations of information technology, PragatiPrakashan Publications
2. E Balagurusami, Programming in basic, Tata Mc-Graw hill

REFERENCE BOOKS

1. D.P. Nagpal, Computer fundamental concepts systems and applications, Wheeler publishing
2. Peter Dyson, Pat Coleman &Lan Gilbert " The ABC's of internet" BPB

15EPE006 Computer Practical Lab 0 0 2 1

Course Objectives: To understand and develop fundamental working knowledge in computer utilities to enable students to improve his ability in correspondence for his documentation work.

List of Practical's:

1. Knowledge of working in Windows
2. MS- WORD (a) Using templates
3. MS Word (b) Font adjustment,
4. MS Word (c) spell checker using Menu commands

5. MS-EXCEL (a) Using data entry,
6. MS Excel (b) adjustments, graphs.
7. MS Excel (c) formulae. MS-POWERPOINT (a) Presentations
8. MS Power point (b) charts, graphs
9. MS Power Point (c) import and Export of data.
10. MS- ACCESS (a) Using data entry, Reports,
11. MS-Access (b) Small menu entries Internet Applications like Browsing,
12. MS-Access (c) Email communication and Using Search Engines etc.

Total hours: 40

COURSE OUTCOMES:

CO-1 : To create and manipulate various operations in word document using MS-Office.

CO-2 : To design and perform various operations in tables.

CO-3 :To generate letters using Mail-Merge.

CO-4 : To implement various editing and formatting operations in spread sheet.

CO-5 : To create power point presentation slides.

CO-6 : To develop programs using various control instructions and operator precedence in C Programming.

CO-7 : To implement string manipulations, arrays and functions for various applications in C.

CO-8 : To analyze the use of structures, unions and pointers in C.

CO-9 : To handle various file operations in C.

CO-10:To design web pages using HTML Tags.

TEXT BOOKS

1. Chanchal Mittal, PragatiPrakashan, Foundations of information technology.
2. D.P.Nagpal, Fundamentals Concepts, Systems & Applications, Wheeler Publishing

REFERENCE BOOKS

1. Chanchal Mittal- PragatiPrakashan, Foundations of Information Technology
2. E.Balagurusami, Computer Programming in BASIC, Tata McGraw-Hill
3. Peter Dyson, Pat Coleman &Lan Gilbert The ABC's of INTERNET, BPB

15EPE007 Engineering Graphics Lab 0 1 2 2

Course Objectives: To understand and develop fundamentals of engineering drawing which will be useful to understand offshore plant drawings and layout based on this fundamental subject, Engineering graphics.

UNIT I Explanation and sketching **8**

Explanation and sketching of the following aspects: Dimensioning conventions of shafts, arcs, angles,holes, tapers, welded joints threads and pipes Conventional representation of metals and materials. Sectioning Conventions, removed sections and revolved sections, parts not usually sectioned, Conventions of gears

UNITII Limits and tolerances **8**

Limits, Fits and Tolerances Limits and tolerances, Surface Finish, Type of fits - Description, Hole basis System and Shaft basis system, calculations involving minimum and maximum clearances for given combination of tolerance grades- Simple problems, Geometric tolerances

UNIT III Sketching **8**

Sketching of the following: Screw threads, screwed fastenings, Rivets and riveted joints. Machinery Component drawing: Drawing of complete machine components in assembly (orthographic to isometric and isometric to orthographic) with details like couplings, Glands, Return and non-return valves, cocks & plugs, cylinder, Boiler mountings - Full bore safety valve, Blow down cock, Gauge glass, Main stop valve.

UNIT IV Marine component drawing **8**

Marine Component Drawing: Assembly Drawing of simple marine components in orthographic projection from Isometric view e.g. Bilge Strainer boxes, Marine diesel piston, Cylinder relief valves, control valve.

UNIT V Projection drawings **8**

Basic concepts of orthographic projections of points, straight lines, planes and solids, section of solids, development and intersection of surfaces, concepts of isometric views, nuts, bolts and screw fasteners Assembly drawing from the given details or details from the given assembly drawing of the following machine elements, simple machines, Steam engine parts etc. Foot step bearing, Rigid flanged coupling, Simple eccentric of steam engine. Piston ~ Ring - rod of steam engine, Stuffing box of Stem tube.

Total hours: 40

COURSE OUTCOMES:

At the end of this course, the student will be proficient in the following areas:

CO-1: Lettering and use of instruments, geometric constructions, isometric sketching, Oblique sketching

CO-2: Orthographic sketching, 2-D computer sketching, 3D computer modelling.

CO-3: Computer assembly modelling, auxiliary views, design and manufacturing features in graphics.

CO-4: Computer model applications to design and manufacturing, section views, dimensions of linear and circular features.

CO-5: Dimensioning using symbols and notes, layout of engineering drawings from 3-D computer models.

TEXT BOOKS

1. N.D.Bhatt, “Engineering drawing (plane and solid geometry)”, Charotar publishing house private limited, 53rd edition, 2015.
2. K. Venugopal and V. Prabhu Raja, “A textbook of engineering graphics”, New age international (P) limited publishers, reprint, 2015.

REFERENCE BOOKS

1. Gopalakrishna K.R., "Machine Drawing", 17th Edition, Sub has Stores Books Corner, Bangalore, 2003.
2. Gill P.S., "A text book on Machine Drawing", S.K. Kataria& sons, Mumbai, 2000.
3. Reed's Engineering Drawing for Marine Engineers (Reed's Marine Engineering Series) (11) (2nd Ed.) Author(s): BECK H.G.
4. MacGibbon's "Pictorial Drawing Book for Marine Engineers-James", 8th Edition,
5. G.Holburn&John J. Seaton, James Munro &Company Limited Engineering and Nautical Publishers, Mumbai, 1978.

15EPE008 Workshop Practice-I 0 0 3 2

Course Objectives: To enhance practical skills of the students in fitting, gas welding, pipe fitting etc which will help the students to understand the pipe lying process in offshore structures and processing plants.

Fitting Workshop

Hands on experience in preparation of V - Joint, Dove tail Joint, T-Joint and Square Joint.

GAS WELDING

Hands on experience in preparation of Butt Joint, Lap Joint, T-Joint and Fillet Joint.

Pipe Fitting Shop

Hands on experience in preparation of Pipe fitting, Pipe Joints, Overhauling valves and pressure testing of valves.

Carpentry

Hands on experience in preparation of Square Joint, T-Joint and Dove tail Joint.

Total hours: 40

COURSE OUTCOMES:
After learning the course the students should be able to

CO-1: Understand applications of hand tools and power tools.

CO-2: Understand the operations of machine tools.

CO-3: Select the appropriate tools required for specific operation.

CO-4: Comprehend the safety measures required to be taken while using the tools.

CO-5: Get hands on experience in preparation of Square Joint, T-Joint and Dove tail Joint.

REFERENCE BOOKS

1. Workshop manuals

15EPE009 Engineering Mathematics-II 3 0 0 3

Course Objectives: To develop the student's ability in understanding engineering mathematics in areas such as differential equation, partial differential equation, algebra of matrices, differentiation and integration of vectors.

UNIT I Ordinary Differential Equations 9

First order Linear Differential equation-Bernoulli's equation-Exact diff. Equation-Equations of I order higher degree-Solvable for p, x, y-Clairaut's Equation-Application to engineering problems .Higher order equations with constant coefficient-Method of variation parameters

UNIT II Partial Differential Equations 9

Formation of Partial Differential Equation-Solution of PDE by direct integration-Solution of Lagrange's equation Pp + Qq = R-Nonlinear equations of first order-Four Types- f (p, q) = 0, f(z, p, q) = 0, f(x, p) = F (y,q) andz = xp + yq + f (p, q).

UNIT III Algebra of Matrices 9

Rank of a matrix-Gauss Jordan method to find the inverse-consistency and inconsistency of system of linear equations-solution of system of linear equations-characteristic equation - Eigen values and Eigen vectors-CayleyHamilton Theorem

UNIT IV Differentiation of vectors 9

Vector Differentiation-velocity and acceleration-Vector operator Del, gradientDivergence and curl-Physical interpretation of divergence of F and Curl F – DelApplied twice to point functions and Del applied to product of point functions.

UNIT V Integration of Vectors 9

Line integrals- Work-Surface integrals - Flux-Green's Theorem n, the plane-Stoke's Theorem-Volume integral-Gauss Divergence Theorem-Simple Problems

Total hours: 45

COURSE OUTCOMES:

CO1: To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

CO2: To have an ability of mathematical modeling of systems using differential equations and ability to solve the differential equations.

CO3: To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.

CO4: To use Stokes' theorem, Green's theorem and Gauss divergence an to give a physical interpretation of the curl of a vector field.

CO5: To introduce the basics of analytic functions and the basics in complex integration this is used to evaluate complicated real integrals.

CO6: Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem.

CO7: To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.

CO8: To introduce the concepts of Laplace Transforms and its applications to various problems related to engineering and technology.

CO9: To be able to find time responses of linear systems using Laplace transforms.

CO10: To apply partial fraction expansion to simplify a transform function for inverse Laplace transformation.

CO11: To apply Laplace Transform methods to solve initial value problems for constant coefficient linear ODEs.

TEXT BOOKS:

1. Dr. B.S.Grewal, "Higher Engineering Mathematics", 40th edition, Khanna Publishers, New Delhi, 2007
2. H.K.Dass, "Advanced Engineering Mathematics", 15thediton, S. Chand Publishers, New Delhi,

REFERENCE BOOK

1. William Embleton OBE, Reeds mathematics for engineers, 7th edition, Adlard Coles Nautical , London

15EPE010 Engineering Physics-II 3 0 0 3

Course Objectives: To develop the students' ability in understanding engineering physics in areas such as ultrasonics, laser and fibre optics, relativity and quantum mechanics, Semi conducting and superconducting materials, Dielectrics, New materials and NDT in order to gain sound knowledge to solve industry related problems.

UNIT I Ultrasonic and Crystal physics 9

Ultrasonic production –magnetostrictionand piezoelectric methods-determination of velocityof ultrasonic waves – SONAR-lattice planes-Miller indices-'d'spacing in cubic lattice-calculation of number of atoms per unit cell-atomic radius-coordination number-packing fact for SC, BCC, FCC and HCP structures.

UNIT II Laser and Fiber Optics 9

Einstein coefficient (A &B)-ND-YAG laser, semiconductor laser-uses of lasers-holography-construction and reconstruction of a hologram – principle and propagation of light in optical fiber -numerical aperture and acceptance angle-types of optical fiber-applications-fiber optics sensors (displacement sensor and pressure sensor).

UNIT III Relativity and Quantum mechanics **9**

Einstein's special theory of relativity-Lorentz transformation –length contraction-time dilation – mass-energy relationship-black body radiation-Plank's theory –deduction of Wien's displacement law and Rayleigh – Jean's law from plank's theory-Compton effect-theory and experimental verification-Schrodinger's wave equation – time independent-physical significance of wave function-particle in a one dimensional box.

UNIT IV Semi conducting and superconducting materials **9**

Extrinsic semiconductor-expression for carrier concentration in n-type and p-type semiconductors-variation of Fermi level with temperature and impurity concentration-Hall effect-determination of Hall coefficient –super conducting phenomena – properties of superconductors-Meissner effect and isotope effect-type I and type II superconductors high temperature superconductors-uses of superconductors.

UNIT V Dielectrics, New materials and NDT **9**

Electrical susceptibility-dielectric constant-electronic, ionic,orientation and space charge polarizations-frequency and temperature dependence of polarization-internal field-Claussius-Mositti relation-uses of dielectric materials-metallic glasses-nano materials-shape memory alloys-bio materials-non destructive testing-liquid penetration method-ultrasonic flaw method-ultrasonic flaw detector-X-ray radiography-displacement method-X-ray fluoroscopy-merits and demerits of each method.

Total hours: 45

COURSE OUTCOMES:

CO-1: Discuss the production of ultrasonics by different methods and their medical applications

CO-2: Relate the crystallographic parameters and crystal growth techniques.

CO-3: Relate the enhance knowledge about photonics and optical fiber communication system

CO-4: Develop the types of lasers and find their applications.

CO-5: Develop the fiber optic communication system and find their applications.

CO-6: Illustrate the appropriate ways of solving quantum mechanical problems.

CO-7: Understand the efficacy of quantum equations in modern areas.

CO-8: Explain the fundamentals of quantum mechanical concepts and describe the phenomenon of electron microscopes.

CO-9: Discuss the classical free electron theories of conducting materials.

CO-10: Explain the theoretical aspects of semiconducting materials and illustrate the correct and efficient ways of solving problems.

CO-11: Compare the types of magnetic and superconducting materials and their applications.

CO-12: Discuss the various types of polarization mechanisms in dielectrics and illustrate the applications of dielectric materials.

TEXT BOOKS

1. Dr. Mani P, “Engineering Physics”, Dhanam Publications, Chennai-42.
2. PalanisamyP.K.,”Physics for Engineers”, Scitech Publications (India) PvtLtd.,Chennai, Second Edition, 2005.

REFERENCE BOOKS

1. Avadhanulu M.N. and Kshirsagar P.G.,”A Text Book of Engineering Physics”,
2. Pillai S.O. “Solid State Physics”, New Age International Publication, New Delhi,Fifth Edition, 2003.
3. Arumugam M., “Engineering Physics”, Anuradha Agencies, kumbakonam, Second Edition, 2005.

15EPE011 Engineering Mechanics 3 0 0 3

Course Objectives: To develop the students' ability in understanding engineering mechanics in areas such as concurrent forces, properties of areas, forces in planes etc., so that the same can be applied to the engineering problems in petroleum industry.

Unit I Concurrent forces on a plane **9**

Concurrent forces in a plane –Composition and resolution of forces and equilibrium of concurrent coplanar forces.Methods of projections.Methods of moment, Friction.Parallel forces in a plane. Two parallel forces.

Unit II Centroid and moment of inertia **9**

Area moment of inertia, polar moment of inertia, theorem of perpendicular axes, moment of inertia of disc, plate, product of inertia, parallel axis theorem for product of inertia, transformation equations for moments and product of inertia.

Unit III General cases of forces in a plane **9**

General cases of forces in a plane - Equilibrium of forces in a plane, planetrusses, method of joint and sections, method of substitution funicular polygon, Maxwell diagrams, flexible suspension cables.Cantilever and simply supported beams with concentrated and distributed and moment loads, S.F and B.M Diagrams, Stress and Strain.

Unit IV Force system in space **9**

Force system in space, principle of virtual work, efficiency of simple machines stable and unstable Equilibrium, Interfacial friction - static, kinetic and rolling friction, Application to inclined planes, wedges, Screw jacks and belts.

Unit V Kinematics and Kinetics of particles **9**

Kinematics and Kinetics of particles - Rectilinear motion of particles relative motion,D' Alembert's principle, inertia couple, constrained motion, non centroidal motion, translation and rotation of rigid bodies, virtual work energy arid work.Curvilinear translation, rotation of rigid body, plane motion of a rigid body, impulse and momentum, conversion and momentum, momentum and momentum equation, rotational motion.

Total hours: 45

COURSE OUTCOMES:

Upon successful completion of the course, you should be able to:

CO-1: Use scalar and vector analytical techniques for analysing forces in statically determinate structures

CO-2: Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems

CO-3: Apply basic knowledge of maths and physics to solve real-world problems.

CO-4: Discuss the various motions in particles; rectilinear motion centroidal motion, curve linear motion etc.

CO-5: Explain the theoretical aspects of inclined planes, wedges, screw jacks and belts.

TEXT BOOKS

1. S. Rajasekara, "Engineering Mechanics-Statics and dynamics", Tata Mc-Graw Hill, NewDelhi, 2004
2. Dr. K.L. Kumar, "Engineering Mechanics", Tata Mcgraw Hill

REFERENCE BOOKS

1. Timoshenko & Young, " Engineering Mechanics", CBS Publishers and distributors private limited, new Delhi, 2004.
2. R. S. Khurmi, Engineering Mechanics, S. Chand and company Ltd. 2008
3. Beer & Johnson, Engineering Mechanics, Tata Mc-Graw Hill, NewDelhi, 2009

15EPE012 Material Science 3 0 0 3

Course Objectives: To develop the students' ability in understanding engineering materials and its metallurgical properties, phase transformations and phase diagram, heat treatment process, various types of steel used for offshore structure construction, Processing plantsetc.,

UNIT I Introduction **9**

Introduction - Role of materials in Technology - Historical development -Economy of material usage- Classification of materials.Structure of Solid.Atomic structure - crystal structure-atomic packing in crystal-miller indices Imperfections in crystals-Types of bonds-Bonding forces and energies - influence of bond type on Engineering properties-thermodynamics and kinetics in materials behaviour - diffusion - structure of metal, alloy, polymer and ceramic strengthening mechanism in metal-metallography.

UNIT II Phase transformation and Phase diagram **9**

Solidification - nucleation - crystallization - single crystal and poly crystalline materials - Polymorphism - Thermodynamic reasoning of phase diagram-simple phase diagram phase rule - lever rule - methods used to determine a phase diagram - Isomorphous system - Eutectic - Eutectoid, peritectic phase diagram - Iron - Carbon system-Martensite formation TTT diagram Hardenability Tertiary system.

UNIT III Heat Treatment **9**

Annealing-process annealing-Spheroidizing - Normalising - Quenching and Tempering process-Austempering - Martempering - Case hardening – Alteration of materials properties by casting, working, joining, sintering – Precipitation –Age hardening - recovery and recrystallisation.

UNIT IV Mechanical properties of Materials and Testing **9**

Elastic, plastic, viscoelastic deformation- Tensile test for metals, polymers, ceramic-Strain aging-fracture - brittle fracture-Griffith's criterion of brittle fracture-fracture toughness-Ductile - brittle transition in fracture - Hardness - fatigue - creep - testing of mechanical properties - Failure analysis and prevention - wear of metal - NDT. Structural Materials

UNIT V Types of steel **9**

Classification of steel-different types of steel-Aluminum& Titanium alloys used in shipbuilding-Propeller materials-Selection of materials-Specification classification society rules-National and International standards for different class of steels.

Total hours: 45

COURSE OUTCOMES:
Upon completion of this course, the students will

CO-1: Be aware of the social, safety and environmental consequences of their work, and be able to engage in public debate regarding these issues.

CO-2: Be able to apply core concepts in Materials Science to solve engineering problems.

CO-3: Be knowledgeable of contemporary issues relevant to materials Science and Engineering.

CO-4: Be able to select materials for design and construction and understand the importance of life-long learning.

CO-5: Be able to design and conduct experiments, and to analyze data.

CO-6: Understand the professional and ethical responsibilities of a materials scientist and engineer.

CO-7: Be able to work both independently and as part of a team.

CO-8: Be able to communicate effectively while speaking, employing graphics and writing.

CO-9: Possess the skills and techniques necessary for modern materials engineering practice.

TEXT BOOKS

1. V. Raghavan, Material Science and Engineering, Prentice-Hall of India (P)Ltd New Delhi.
2. Donald S Clark-Physical Metallurgy for Engineers, East West Press (P) Ltd, New Delhi.

REFERENCE BOOKS

1. A.G. Guy-Introduction to Materials science, McGraw Hill Ltd International Student Edition.
2. Hanson - The Engineer's Guide to steel, Addision - Wesley Pub.Company Inc.
3. Stephen. C. Dexter - Handbook of oceanographic engineering materials

15EPE013 C Programming & Language 3 0 0 3

Course Objectives: To understand fundamental concepts of computer programming which will help students to develop their ability in programming languages which the student will be using later in the design offices.

UNIT I Basic structure and execution of C Programmes 9

Constants,Variables,Data Types, Various type of Declarations, Different type Operations and expressions, Evaluation and Expressions, Operator precedence and Associability, Mathematical-functions.

UNIT II Managing Input and Output Operations and arrays 9

Decision Making, decision making looping, Branching decisions, Declaration and Initializations, One-dimensional arrays,Two-dimensional arrays, Initialization arrays, Dynamic Arrays,Arrays of Strings, an example using string arrays.

UNIT III Reading and Writing strings **9**

Arithmetic operations on characters, Putting strings together, Comparison of two strings. String – handling functions, Table and other features of strings, reading a string from the keyboard, some C++ library functions for strings, using the null terminator.

UNIT IV Need and elements for user defined functions **9**

Functions, Return value of function, Functions call and declaration, Arguments and corresponding return values, Multiple Values, Nesting functions, Recursion, Passing arrays and strings to functions, The Scope,Visibility and life time of variables

UNIT V Structure Variables **9**

Declaring structure, Variable and accessing structure members, Initialization of structure, Comparing structure variables.Arrays of structure, Structure within structures, Structure and functions, Unions, Size of structures, Bit fields.

Total hours: 45

COURSE OUTCOMES:

At the end of the course student will be able to

CO-1: Identify the parts of the computer system.

CO-2: Adequately explain functioning of computer components.

CO-3: Explain the process of problem solving using computer.

CO-4: Design an algorithmic solution for a given problem

CO- 5: Write a maintainable C program for a given algorithm.

CO-6: Trace the given C program manually.

CO-7: Write C program for simple applications of real life using structures and files.

CO-8: Explain role of Operating system in computer system and applications of computer networks.

TEXT BOOKS

1. E. Balagurusamy,C- Programming ANSI , Tata McGraw-Hill Education, 2008
2. Chanchal Mittal, “Foundations of Information Technology”, PragathiPrakashan Publishers, 9th edition, 2013.

REFERENCE BOOKS

1. A.K. Kanthane-programming with ANSI and TURBO C, Pearson education, New Delhi, 2004
2. Y. Kannetkar- Let us C 4th Edition BPB Publication, New Delhi, 2002.

15EPE014 C Programming Practical 0 0 2 1

Course Objectives: To understand fundamental concepts of computer programming which will help students to develop their ability in programming languages which the student will be using later in the design offices.

List of Experiments

1. Program to show swap of two numbers without using third variable.
2. Program to find the Largest and Smallest of the given three numbers
3. Program to find the roots of the Quadratic Equation
4. Program to print the Fibonacci series up to 100.
5. Program to reverse a given number.
6. Program to find area and perimeter of circle and square using switch case
7. Program to display series and find sum of 1+3+5+……..+n.
8. Program to find whether a string is palindrome or not and to count no of Vowels and consonants in a string
9. Program to show Sum of 10 elements of array & show the average and to find the maximum and minimum number in an array
10. Program to find factorial of a number using recursion function and to perform Mathematical operation using function
11. Program to find sum of diagonal elements in a Matrix and to find sum and multiplication of two matrixes.
12. Program to swap the numbers using pointer and to find mark list using structure

Total hours: 40

COURSE OUTCOMES:

CO-1: Students will learn the concept of DOS System commands and Editors

CO-2: Students will learn the concept of UNIX system commands

CO-3: Students will learn the concept of Simple Programs and demonstrate control structure. Programs involving functions and recursion

CO-4: Students will learn the concept of Programs involving the use of arrays with subscripts, pointers structures and files

CO-5: Students will learn to program diagonal elements in a matrix and find the sum and multiplication of two matrixes.

15EPE015 Physics Lab 0 0 2 1

Course Objectives: To develop the student's ability in understanding principles of refractive index, harmonic motion, resistance, frequency, wavelength of sodium light, voltage, monochromatic light etc., which will be useful to the student in their profession.

List of Experiments

1. Error analysis in measurements
2. To determine the wave length of prominent spectral lines of mercury light by a plane Transmission Grating
3. To determine the resistance per unit length of a Carey fosters bridge wire
4. To determine the frequency of AC mains with the help of sonometer.
5. To determine the wavelength of sodium light by Newton ring method
6. measurements of voltage and frequency of a given signal using Lissajous figures
7. To determine wavelength of monochromatic light by fresnalbi prism8 Ray tracing of optical components and to prove the laws of geometrical optics.
8. Verification of Brewster's law and to find the refractive index of the material
9. Measurements of magnetic field along the axis of a circular coil and to verify Biot-Savartlaw.
10. Specific rotation of sugar solution by using polarimeter
11. Measurements of spring constant using simple harmonic motion
12. Measurements of Numerical Aperture of a plastic Fiber
13. Verification Paschen's curve in a gas discharge tube

Total hours: 40

COURSE OUTCOMES:

CO-1: Analyze the some of the most common error analysis in measurements.

CO-2: Measure the resistance of the given wire by Carey fosters bridge.

CO-3: Analyze the frequency of AC mains with the help of Sonometer experiment.

CO-4: Determine the wavelength of sodium light by Newton rings method.

CO-5: Determine the voltage and frequency of a given signal by using Lissajous figures

CO-6: Determine the magnetic field along the axis of a circular coil carrying current by Biot-Savart's law.

CO-7: Measure the specific rotation of sugar solution by using polarimeter method.

CO-8: Analyze the numerical aperture of a plastic fiber by using laser source.

15EPE016 Chemistry Lab 0 0 2 1

Course Objectives: This is designed to expose the students to classical methods of analysis as well as instrumentation methods. Some experiments deal with the conventional volumetric gravimetric techniques, semi- micro techniques, ion-selective electrodes, conductometric methods, spectroscopic methods, and thermal analytical methods

List of Experiments

1. Introduction to various analytical techniques (conventional techniques like volumetric, gravimetric, and electrochemical, separation and spectrophotometric techniques), statistical methods employed in analytical techniques, general awareness regarding laboratory upkeep and safety.
2. Qualitative semi-micro analysis of cations and anions.
3. Qualitative semi-micro analysis of mixture of cations and anions by group separation methods.
4. Chromatographic techniques: (a) Identification of unknown mixture by spot test analysis (b) Quantitative determination of Limonene using gas chromatography (c) acetylation of ferrocence and analysis using TLC (d) Pesticide analysis using HPLC.
5. Spectroscopic techniques: (a) Quantitative analysis of total iron / copper / chromium / Ag / Hg present in given sample of water using AAS (b) Verification of Beer-Lambert's law using UV-vis spectrophotometer.
6. Electrochemical techniques (a) Determination of dissociation constant and titration using conductance of electrolytic solutions (b) Acid hydrolysis of ethyl acetate.
7. Thermo chemical measurements: (a) DSC of given sample (b) determination of calorific value using Junker/ Bomb calorimeter.
8. Water pollution monitoring and control: (a) DO determination (b) BOD (c) COD (d) Free chlorine (e) pH and alkalinity (f) total Hardness (g) MPN count (h) Optimizing the dose of added coagulant by Jar test (i) Analysis of alum and determination of water soluble alum compounds as alumina (Al_2O_3)
9. Air pollution monitoring and control: (a) Flue gas analysis using Orsat apparatus (b) Analysis of SO_2 (c) analysis of NOx, CO and CO_2.
10. Use of advanced techniques for chemical waste minimization:
    (a) Application of computational technique in chemistry
    (b) Application of combinational chemistry.
11. Fuel and Lubricants: (a) determination of open and close flash points (b) determination of Viscosity using Redwood-I viscometer (c) Proximate analysis of given solid fuel (d) Ultimate analysis

Total hours: 40

COURSE OUTCOMES:

CO-1: Concept of Thermodynamic system.

CO-2: Idea of Reaction Dynamics and Solid state Chemistry.

CO-3: General idea of Electrochemistry.

CO-4: Basic idea of Structure and reactivity of Organic molecule.

CO-5: Overview of Industrial Chemistry

15EPE017 Electrical & Electronics Engineering Lab 0 0 2 1

Course Objectives: To develop the students' ability in understanding the usage of ammeter, voltmeter, current and voltage distribution, three phase induction motors, Power and power factor of single phase circuits, relation between line and phase quantities in 3 phase star and delta connection etc.,

List of Experiments

1. Measurement of' Low and High resistances by Voltmeter and Ammeter method
2. To obtain the currents and voltage distribution in A.C, 'R-L-C' series circuits and draw the vector diagrams.
3. To obtain the currents and voltages distribution in A.C, 'R-L-C' parallel circuits and draw the vector diagrams.
4. Power and power factor of single phase circuits: To measure the power and power factor of a single-phase lead by 3 voltmeter method& 3 ammeter method.
5. To obtain the relation between line and phase quantities in 3 phase star and Delta connection.
6. To measure the power input to 3-phase induction motor using two watt meters.

Total hours: 40

COURSE OUTCOMES:

CO-1: Students will learn the concept of electrostatics

CO-2: Students will learn the concept of DC Machines

CO-3: Students will learn the concept of Single phase transformer

CO-4: Students will learn the concept of phase induction motor

CO-5: Students will learn the concept of Three phase system

CO-6: Students will learn the concept of General structure of electrical power system

15EPE018 Workshop Practice-II 0 0 3 2

Course Objectives: To develop the students skill in usage of lathe machinery, arc welding set and fitting workshop activities which will be useful to the students while working in offshore industry and processing plants in dealing with the in various activities of manufacture.

Lathe Workshop

Hands on experience in preparation of turning, Facing, Taper turning, Thread cutting and External thread cutting.

Arc Welding

Hands on experience in preparation of Butt Joint, Lap Joint,T - Joint, outside corner Joint and Fillet Joint.

Fitting Workshop

Hands on experience in preparation of various types of joints

Total hours: 40

COURSE OUTCOMES:

CO-1: Students will learn the concept of Lines, Lettering, Dimensioning, Scales.

CO-2: Students will learn the concept of geometrical construction and curves

CO-3: Students will learn the concept of projection of points, lines, surfaces

CO-4: Students will learn the concept of projection of solids

CO-5: Students will learn the concept of drawing isometric view from orthogonal/ sectional views of simple solid objects

CO-6: Students will learn the concept of full and half sectional views of solids

CO-7: Students will learn the concept of computer aided drafting

15EPE019 Engineering Mathematics III 3 1 0 4

Course Objectives: The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. 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 Partial Differential Equations 12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II Fourier Series 12

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 III Boundary Value Problems 12

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV Fourier Transform 12

Introduction, Euler's formulae, conditions for a fourier expansion, functions having points of discontinuity, change of interval, odd and even functions-expansions of odd or even periodic functions, half-range series, typical wave-forms, parseval's formula, complex form of F-series, practical harmonic analysis.

UNIT V Z -Transform and Difference Equations 12

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform. Transforms of derivatives and integrals, evaluation of integrals by laplace transform.

Total hours: 60

COURSE OUTCOMES:

CO-1: To have a basic understanding of first order partial differential equation and Lagrange's Linear Equation.

CO-2: To be well versed with second and higher order partial differential equations.

CO-3: To clearly understand the general concepts in Fourier series.

CO-4: To be well versed with complex Fourier series problem and harmonic analysis.

CO-5: To be skillful in applying boundary conditions to boundary value problems.

CO-6: To be an expert in solving heat equation problems in one and two dimensions.

CO-7: To understand the concepts of sine and cosine transforms properties.

CO-8: To clearly explain the differences between Fourier Transform and Fourier series.

CO-9: To clearly understand the concepts and applications of Z-Transform

CO-10: To solve different differential equations by using Z-Transform methods.

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy, P.Thilagavathy and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.
3. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCE BOOKS

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen , New York ,1988.
2. Narayanan, S., ManicavachagomPillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

15EPE020 Principles of Petroleum Engineering 3 1 0 4

Course Objectives: To impart basic knowledge about the various facts of Petroleum Engineering,Structure of petroleum compounds, Drilling, Formation Evaluation, Well Testing and Well site operations - Also to understand the basic Principles of Petroleum Engineering**.**

Unit I: Introduction **12**

Chemistry of petroleum - Structure of petroleum compounds,Types – alkanes, Napthenes, paraffins, aromatics.Physical and chemical properties of formation fluids, engineering economics.

Unit II: Drilling **12**

Drilling – History, types of drilling –cable tool, rotary, drilling rigs and components. Drilling fluids, casing and cementation .Types of wells – exploratory, delineation, development wells. Vertical, deviated, inclined, horizontal and ERD wells. - Planning – GTO.

Unit III: Logs **12**

Formation Evaluation – cutting, cores, mud logging unit,well logging, types of well logs and their use. Basic relationships of well log interpretation, the spontaneous potential (SP) log, gamma ray and caliper log, resistivity log, porosity and lithology determination.

Unit IV: Well testing and production **12**

Well Testing, perforation, testing methods, well completion production. Stimulation methods, recovery methods, Material balance, reserves estimation,drilling fluid control, data acquisition during drilling.

Unit V: Environmental concerns 12

Introduction to environmental control in the petroleum industry, environmental transport of petroleum wastes, Well site operations, roles of drilling, reservoir and production, hazards, environmental concerns, transportation of oil and gas, oil pollution and control, petroleum economics.

Total hours: 60

COURSE OUTCOMES:

CO-1: To be well versed with the fundamental principles of petroleum engineering stream and Industry as well.

CO-2: To be aware of the physical and chemical properties of reservoir oil, gas, and formation water.

CO-3: To clearly understand the basic concepts in oil and gas drilling.

CO-4: To have basic knowledge about different types of wells.

CO-5: To be well versed with formation evaluation and well logging.

CO-6: To understand the criteria of rock cuttings, cores, and mud logging.
CO-7: To understand the principles of well testing and production analysis.

CO-8: To be well versed with material balance and recovery methods.

CO-9: To be aware of the environmental threats associated with oil and gas production.

CO-10: To understand the various forms of petroleum transportation and economics as well.

TEXT BOOKS

1. J.CH Garry, HardwardG.E and M.J.Kaiser, Petroleum Refining: Technology and economics, CRC Press ,V Edition,2007
2. A.G.LucasHurley ,Modern Petroleum Technology Upstream, Edition 2002.
3. A.LucasHurley ,Modern Petroleum Technology Downstream, VolII, VI Edition, 2002.

REFERENCE BOOKS

1. Garry,Hardward G.E and M.J.Kaiser,Petroleum Refining : Technology and economics ,Vth Edition 2007, CRC Press.
2. A.G. Lucas Modern Petroleum Technology Upstream,Vol I Hurley Publishing, Edition 2002.
3. A.Lucas,Modern Petroleum Technology Downstream,Vol II Hurley Publishing, VI Edition 2002.

15EPE021 Petroleum Geology 3 0 0 3

Course Objectives: To impart sound knowledge on nature and properties of rocks and minerals, their sedimentation pattern, sedimentary basins and geological methods in search of hydrocarbons and well site geological methods.

UNIT I: Introduction **9**

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

UNIT II: Rocks **9**

Type of rocks and their formation, texture, minerals and properties, clay minerals,Sedimentary rocks – classification of rocks, types of sedimentary rocks, properties, sedimentation process, sedimentary environments.

UNIT III: Geomorphology **9**

Geomorphology – concepts, processes, stratigraphy – principles, order of superposition, palaeontology and index fossils structural geology – principles, folds, faults, joints and unconformities; Geology of India.

UNIT IV: Origin of Petroleum **9**

Origin and distribution of petroleum -Sedimentary basins – types, origin and classifications petroleum system – Generation, Migration, Accumulations of hydrocarbons.Description of some Indian petroliferous basin.

UNIT V: Testing and Analysis **9**

Well site geological methods – sample collection & description, fluorescence, cores & core analysis, correlation and introduction to various geological maps, sedimentary basin analysis, stratigraphic methods.

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the basic concepts of petroleum geology.

CO-2: To clearly understand the geological basin and hydrocarbon reservoir.

CO-3: To clearly explain the different rock types and properties.

CO-4: To be well versed with the sedimentary basins, stratigraphy and sedimentation process.

CO-5: To have a basic knowledge about geomorphology and palaeontology.

CO-6: To be well versed with principles of structural geology and Indian basins as well.

CO-7: To be well versed with origin of petroleum in source rock.

CO-8:To clearly understand the subsurface process of petroleum migration and accumulation.

CO-9: To be well aware of various geological testing for petroleum zone identification.

CO-10: To clearly understand the various mapping techniques.

TEXT BOOKS

1. Cox, P.A., “The Elements on Earth”, Oxford University Press, Oxford 1995.

2. Wilson, M., Igneous Petrogenesis”, Unwin Hyman, London 1989.

REFERENCE BOOKS

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.

15EPE022 Petroleum Geophysics & Geochemistry 3 0 0 3

Course Objectives: To impart knowledge on the concepts of geophysics and geochemistry for petroleum exploration, geophysical methods – gravity, magnetic, seismic, data acquisition, processing and interpretation, 2D, 3D, 4D seismic and geochemical evaluation methods.

UNIT I: Introduction to geophysics 9

Geoscience disciplines, Geoengineering concept, Introduction to geophysics, geophysical methods of exploration, physical properties of rocks-density, susceptibility, resistivity, elasticity, factors controlling the properties.

UNIT II: Gravity and magnetic methods 9

Gravity and Magnetic methods – Gravity method –definition, gravity surveying, measurement methods, anomalies data interpretation.Magnetic methods – concepts, survey and measurements, anomalies, interpretation.

UNIT III: Seismic methods **9**

Fundamentals of elasticity, Bulk Modulus, Poisson's ratio, elastic seismic wave theory, body and surface waves, P&S waves, seismic instruments, seismic channels, application of seismic data, interpretation of data and maps.

UNIT IV: Hydrocarbons **9**

Composition and characteristics of liquid and gaseous petroleum hydrocarbons-normal, branched and isoalkanes, aromatics, asphaltenes, resins. Hydrocarbon impurities, oil field waters – definitions and characteristics.

UNIT V: Survey **9**

Surface and subsurface geochemical surveys, Role of geochemistry in petroleum exploration, organic matter and kerogen – characteristics and types.Maturation, measurement of maturity-thermal alteration index, vitrinitereflectances.Rock Eval, Hydrogen index, gas chromatography.

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the basic concepts in geophysics.

CO-2: To be well versed with different geophysical oil and gas exploration methods.

CO-3: To be aware of gravity and magnetic methods.

CO-4: To clearly understand the principles of surveying, anomalies, and interpretation.

CO-5: To acquire the fundamental knowledge about the working process of Seismic method.

CO-6: To solve any concrete specific problem in seismic results that is interpretation.

CO-7: To be well versed with the geochemistry of reservoir and surrounding rocks.

CO-8: To be aware of the chemistry of crude oil.

CO-9: To understand the subsurface geochemical surveys.

CO-10: To know the rock physical and chemical properties.

TEXTBOOKS

1. Mason, B. and Moore, C.B., "Introduction to Geochemistry", Wiley Eastern, 1991.
2. Faure, G., 1986, Principles of isotope Geology, John Wiley, 2002.

REFERENCE BOOKS

1. The Blue Planet : An introduction to Earth System Science 2nd Edition by Brain J.Skinner, 2005.
2. Hoefs, J., "Stable Isotope Geochemistry"., Springer Verlag, 1980.
3. Krauskopf, K.B., "Introduction to geochemistry", McGraw Hill, 1967.

15EPE023 Fluid Mechanics 3 0 0 3

Course Objectives: To develop student's ability to understand fundamentals of fluid mechanics, fluid motion, equation of motion, Newton's law of fluid friction, laminar and turbulent flow, various types of pump, friction coefficient, continuity equation etc.,

UNIT-I: Introduction to Fluid Mechanics **9**

Concept of fluid- fluid as a continuum – physical properties- density, specific weight, specific volume & specific gravity, problems- thermodynamic properties- isothermal process, adiabatic process, dimension of R, universal gas constant, problems- pressure-viscosity-types of fluid-surface tension-capillarity-vapour pressure &cavitations-problems.

UNIT-II: Fluid Statics **9**

Fluid pressure-Pascal's law-pressure variation in a fluid at rest –measurement of pressure: manometers-simple & differential manometer-pressure at a point in compressible fluid-temperature at any point in compressible fluid-problems- hydrostatic forces on a submerged surfaces: vertical, horizontal, inclined & curved –problems-buoyancy & flotation

UNIT-III: Fluid Kinematics, Fluid Dynamics **9**

Classifications of fluid flow-acceleration in fluid flow-streamlines, path lines & streak lines-examples –equation of continuity & its application - Equation of motion, Bernoulli's equation, Navier stokes equation of motion – problems

UNIT-IV: Flow Measurement, Transmission Of Energy **9**

Venturi, Orifice, nozzles, mouth pieces-pitot tube & sharp crested weirs/notches – steady flow through pipes-Darcy Weishbach equation-losses in pipelines-Hydraulic & energy gradient Uniform in open channels-Chezy's equation - Fanning's equation-Economical rectangular cross section- Trapezoidal cross sections

UNIT-V: Compressible Fluids, Dimensional Analysis &Similitude **9**

Isothermal adiabatic flow- continuity & energy equations-steady flow of gases through venture meter &pipes.introduction – dimensions of physical quantities- dimensional homogeneity-dimensional groups; Buckingham π theorem –group method- Rayleigh's method of indices-dimensionless numbers- applications of dimensional method- similitude-problems

Total hours: 45

COURSE OUTCOMES:

CO-1: To acquire the fundamental knowledge and concepts of fluid mechanics.

CO-2: To be aware of basic thermodynamic properties.

CO-3: To understand the behavior of fluid at rest.

CO-4: To understand the impacts of hydrostatic forces on fluid flow in a particular medium.

CO-5: To clearly differentiate the concepts of fluid kinematics and dynamics.

CO-6: To be well versed with stream line flow, continuity, Bernoulli, and Navier Stokes equations.

CO-7: To be aware of the different flow measurement techniques.

CO-8: To clearly understand the fluid flow in different channels.

CO-9: To understand the steady state fluid and isothermal adiabatic flows.

CO-10: To be well versed with dimensional analysis.

TEXT BOOKS

1. Neol de Nevers, "Fluid Mechanics for Chemical Engineers." Second Edition, Tata 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.CabeW.L.Smith, J.C and Harriot, P "Unit operations in Chemical Engineering", Mc.Graw Hill, V Edition, 2001.

REFERENCE BOOKS

1. James O.Wilkes and Stacy G.Bikes, "Fluid Mechanics for Chemical Engineers", 3rd edition, 2001.
2. White F.M., "Fluid Mechanics", IV Edition, Mc.Graw – Hill Inc. 1999.
3. Darby, R. "Chemical Engineering Fluid Mechanics" Marcel Decker, 1998.

15EPE024 Electronics & Instrumentation 3 0 0 3

Course Objectives: To impart Knowledge on Various instrument systems and their errors, various signal conditioning circuits. To understand the Principle of various active and passive transducers, Various storage and display devices, Instruments for measuring the various electrical and electronics quantities.

UNIT-I Semiconductor Basics **9**

Introduction to semiconductors – Intrinsic and Extrinsic – Doping – P and N type semiconductors – charge carriers – valence and conduction bands.P-N Junction:PN junction diode – barrier potential – forward and reverse bias – diode specifications – diode as a rectifying element – half wave, full wave and bridge rectifier – filter circuits – ripple filtering – capacitor, inductor and combination filters.

UNIT-II Zener Diode **9**

Breakdown voltage – avalanche and zener breakdowns – operation under forward and reverse bias – zener diode as a voltage regulator.Bipolar Junction Transistor:PNP and NPN types – construction – working principles – transistor as a switch and as amplifier – series and shunt voltage regulators – transistor configurations – CB, CE and CC.

UNIT-III Special Semiconductor Devices **9**

Light Emitting Diode, Liquid Crystal Display, 7segment displays – Diode for Alternating Current (DIAC) - Triode for Alternating Currents (TRIAC) – Device characteristics, Input output characteristics,- their applications.

UNIT-IV Digital Electronics **9**

Basic gates and derived logic gates – simplified implementation –conversions between analogsignals and digital signals, transfer characteristic of DAC, digital to analog conversion techniques, performance parameters of DAC.

UNIT-V Transducers **9**

Primary and secondary – active and passive – analog and digital transducers – pressure, temperature, speed, displacement and light sensors – open loop and closed;loop configurations.

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the basic concepts of semiconductor.

CO-2: To be aware of diode components and filter methods.

CO-3: To clearly understand the Zener diode functions.

CO-4: To be well versed with the working process of bipolar junction transistor.

CO-5: To have the knowledge and awareness about special semiconductor devices.

CO-6: To clearly explain the difference between DIAC and TRIAC diodes.

CO-7: To be well versed with digital electronics.

CO-8: To clearly understand the signal conversions between analog and digital.

CO-9: To be well aware of transducer functions.

CO-10: To understand the physical quantity sensors and identify the open loop, and closed loop configuration

TEXTBOOKS

1. Morris, A.S ," Principle of Measurement and Instrumentation ", Prentice Hall of India ,1999.
2. Doebelin E.O., "Measurement Systems - Application and Design ",Tata McGraw Hill Publishing Company-1990

REFERENCE BOOKS

1. Murthy , D.V.S., " Transducer and Instrumentation ", Prentice Hall of India Pvt. Ltd. , 1995.
2. Millman J. and Halkias .C., " Integrated Electronics ", 4 Edition,TataMcGraw Hill Publishing Company-2001

15EPE025 Geology Practical 0 0 2 1

Course Objectives: To determine experimentally the Preparation of terrain and Plotting of geological data on terrain map. Also to identify the structure contour maps. Preparation of porosity and saturation map and reserves can be estimated in the Laboratory.

List of Experiments

1. Preparation of terrain profile map
2. Plotting of geological data on terrain map.
3. Preparation of subsurface geological section
4. Lithological correlations
5. Preparation of structure contour maps.
6. Preparation of porosity and saturation map
7. Estimation of reserves.

Total hours: 40

COURSE OUTCOMES:

CO-1: Students develop the ability to recognize mineral properties and use those to differentiate and identify common rock forming minerals.

CO-2: Students acquire the skills to classify igneous rocks using texture and composition as identified in hand samples.

CO-3: Working with sedimentary rocks students demonstrate their ability to differentiate clastic versus chemical sedimentary rocks; are able to identify the respective rock types and provide a reasonable environment of deposition.

CO-4: Students apply their mineral identification skills and knowledge of degrees of foliation to identify metamorphic rocks.

CO-5: Students will demonstrate an understanding of topographic maps, rules of contours, and the common coordinate systems in use including the public land survey system.

CO-6: Students develop the skills to allow them to recognize and interpret geologic features using geologic maps, topographic maps, and images. Features include those associated with structures, river systems, coastal systems, glacial systems.

CO-7: Students will acquire an understanding of water issues related to water availability and water quality as it relates to important issues such as sink holes, contamination, use in energy, etc.

CO-8: Students will demonstrate a basic understanding of geologic concepts as they investigate natural hazards and the tools to mitigate the risks to society. Focus will be on flooding, mass wasting, and earthquakes.

CO-9: Students prepare for and pass a final exam on rocks and minerals and a second exam on identifying geologic features from maps and photos.

15EPE026 Fluid Mechanics Practical 0 0 2 1

Course Objectives: To determine experimentally the flow characteristics of fluids and also to determine theefficiency of the flow measuring devices and fluid transport machineries. To give the exposure of all the fluid mechanics equipments and also to visualize thefundamentalconceptoffluidmechanics.

List of Experiments

1. Determination of co-efficient of discharge by using Orifice Meter both by experimentally and graphically.
2. Determination of co-efficient of discharge by using Venturi Meter both by experimentally and graphically
3. Study the performance of a reciprocating pump and to determine the characteristics with maximum efficiency by using Reciprocating Pump
4. Verify Bernoulli's Theorem Apparatus
5. Determination of kinematic viscosity and absolute viscosity of lube oil at different temperature by using Redwood Viscometer
6. Identify the type of flow (Laminar, Transition and Turbulent) by using Reynolds apparatus
7. Calculation of friction factor by using Darcy Weisbach Equation theoretically

Total hours: 40

COURSE OUTCOMES:
Upon completion of the lab, students will be able to:

CO-1: Identify, name, and characterize flow patterns and regimes.

CO-2: Understand basic units of measurement, convert units, and appreciate their magnitudes.

CO-3: Utilize basic measurement techniques of fluid mechanics.

CO-4: Discuss the differences among measurement techniques their relevance and applications.

CO-5: Measure fluid pressure and relate it to flow velocity.

15EPE027 Electronics & Instrumentation Practical 0 0 2 1

Course Objectives: To provide practical knowledge in sensors and transducers.Emphasis on characteristics and response of various transducers like resistive, inductive and capacitive type. To provide an adequate knowledge about pressure measuring instruments.To expose the students pertaining to various lab instruments which they will come across in the Industry.

List of Experiments

1. Characteristics of Zener Diode.
2. Characteristics of Temperature Transducers
3. Measurements of Force Using Load Cell & Strain Gauge
4. Piezoelectric Transducer
5. Loading Effect of Potentiometer
6. Electrical Level Measurement Using Resistance And Capacitance Methods
7. Calibration of Temperature Transducers
8. Lissajous Pattern-To Determine Unknown Frequency Using CRO
9. Study Of CRO And Its Characteristics
10. Half-Wave Rectifier With and Without Filter.
11. Full-wave Rectifier With and Without Filter
12. To Measure Ac Voltage, Dc Voltage And Frequency Of An Ac Signal Of The Given Wave Using Cathode Ray Oscilloscope

Total hours: 40

COURSE OUTCOMES:

CO-1: To measure and calculate the fluid flow in different channels.

CO-2: To identify the nature of fluid flow such as laminar, transition, and turbulent.

CO-3: Perform the basic experiments; improve an basic skills and attitude which help them to apply these skills in their field of engineering.

CO-4: Understand the handling maintenance and performance of basic Instruments.

CO-5: Understand the practical knowledge of various Electronics& Electrical phenomena by demonstration of experiments.

15EPE028 Engineering Mechanics Lab 0 0 2 1

Course Objectives: To develop student's ability to understand experimentally bending moments, funicular polygon, belt friction, pulley block for lifting various loads, Worm and worm wheel, screw and screw jacks, helical springs, etc.

List of Experiments

1. Bending Moments - To determine experimentally the bending moment in (a) A cantilever and (b) A simply supported beam and to compare experimental values with the theoretical values.
2. Funicular Polygon - To find magnitude and position of resultant force experimentally and to check the same by constructing the Funicular Polygon Graphically.
3. Belt Friction - To determine the value of u between the Belt and the pulley.
4. Fly Wheel- To determine the moment of Inertia of a fly wheel by falling weigh method and to also determine the friction moment in the bearings.
5. Friction - To compare coefficient of friction between two given pairs of surfaces by Sliding on an inclined plane.
6. Screw and Screw Jack - to compare effort required for lifting various loads, effort lost in friction and efficiency for (a) Screw jack and (b) Winch crab.
7. Pulley Block - To compare effort required for lifting various loads, effort lost in friction and efficiency for 4-pulleyed and 5 pulley systems.
8. Worm and worm wheel- To determine effort required for lifting various loads effort lost in Friction and efficiency.
9. To find the force of friction and moment of inertial of a rolling wheel by application of General equations of plane motion.
10. Helical spring - To study the compression/Extension of a helical spring and to find its Stiffness and modulus of rigidity at various loads.

Total hours: 40

COURSE OUTCOMES:

CO-1: Students will get the concepts of Mechanics in engineering

CO-2: Students will get the concepts of Vector Algebra and Two dimensional force systems

CO-3: Students will get the concepts of Equilibrium of forces in two dimensions

CO-4: Students will get the concepts of Distributed Force

CO-5: Students will get the concepts of Introduction to Dynamics

CO-6: Students will get the concepts of Kinetics of particles

15EPE029 Engineering Mathematics – IV 3 1 0 3

Course Objectives: With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

UNIT I: **Random Variable** **9**

Axioms of Probability-Conditional Probability-Total Probability-Bayes Theorem-Random Variable-Probability Mass Function-Probability Density Functions-Properties- Binomial, Poisson and Normal distribution

UNIT II: **Two dimensional random variable** **9**

Joint distributions – Marginal and conditional distributions – Covariance –Correlation and regression – Transformation of random variable – central limit theorem, orthogonal curves, harmonic functions.

UNIT III: **Testing of hypothesis** **9**

Sampling distributions –Testing hypothesis for mean ,variance, proportions and difference using normal-square-chi square and F- distributions –Tests for independence of attributes and goodness of fit.

UNIT IV: **Design of experiments** **9**

Analysis of variance – One way classification – Completely randomized design – Two way classifications- Randomized Block design – Latin square.

UNIT V: **Statistical Quality Control** **9**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the concepts in random variables.

CO-2: To be well versed with probability and normal distributions.

CO-3: To clearly understand the principles of 2D random variables.

CO-4: To be aware of random transformation variable and central limit theorem.

CO-5: To clearly understand the hypothesis test concepts.

CO-6: To be well aware of Chi-Sqaure, T and F test methods.

CO-7: To understand the fundamental concepts of design of experiment models.

CO-8: To be well versed with two way classification and randomized black design.

CO-9: To understand the statistical quality control.

CO-10: To be well versed with control charts, tolerance limits, and acceptance sampling.

TEXT BOOKS

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. Dr. B.S. Grewal, "Higer Engineering Mathematics", 40th edition, Khanna Publishers, New Delhi, 2007.

REFERENCE BOOKS

1. Spiegel, M.R, Schiller, J and AluSrinivasan, R, "Schaum Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi,2007.
2. Milton.J.S. andArnold.J.C, " Introduction to probability and Statistics', Tata McGraw Hill, 4th Edition, 2007

15EPE030 Reservoir Engineering I 3 0 0 3

Course Objectives: To introduce the basic concept of Reservoir Engineering, estimation of hydrocarbon volume in place and recovery calculations. Students will be able to gain knowledge of Petroleum Reservoir, fundamentals of petro-physics, interrelation between petro-physical parameters capillary gravity equilibrium and initial fluid distribution.

UNIT I Introduction 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 Reservoirs 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 Fluid in reservoirs 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 Residual oil **9**

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

UNIT V Well analysis **9**

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

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the fundamental concepts in reservoir engineering.

CO-2: To be well versed with the general phase behavior of oil, gas, and condensate reservoirs.

CO-3: To clearly understand the mass balance concepts and equations.

CO-4: To understand the reservoir pressure maintenance and waterflood mechanisms.
CO-5: To understand the fluid flow in porous rocks, especially during waterflood.

CO-6: To be well aware with permeability variation and Darcy laws of fluid flow in porous medium.

CO-7: To understand the residual oil and recovery in oil reservoirs.

CO-8: To clearly understand the mechanism of chemical flooding and thermal recovery.

CO-9: To be aware of well inflow equations and constant terminal solutions.

CO-10: To understand the steady state solutions and pressure buildup analysis techniques.

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

REFERENCE BOOKS

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).

15EPE031 Petroleum Thermodynamics 3 0 0 3

Course Objectives: To impart knowledge on principles of thermodynamics and will be able to apply this knowledge to new situation. To calculate the parameters such as specific heats, vapour pressure and compressibility factor and Calculate the heat of reaction, heat of formation, etc. and will be able to draw the P-T, T-X-Y diagrams for single and multi-component systems.

UNIT I: Introduction **9**

Behaviour of Gases and Liquids – Gas laws, Density, Mole percent, Weight percent, Volume percent, Specific gravity, Heat, work closed and Open Systems, First and Second Laws of thermodynamics, specific heats, compressibility factor, PVT relationships, Vapour Pressure,Claussius-Clayperson equation, heat of vaporization.

UNIT 2: Chemical Thermodynamics of Petroleum Hydrocarbons **9**

Free energy, change, heat of reaction, Entropy change, Heat capacity, Heat of formation, fugacity, Pressure – volume diagram, Density – Temperature diagram for one and two component system. Pressure – Composition diagram, Temperature – Composition diagram, temperature – Composition diagram for multi component system Gibbs phase rule.

UNIT 3: Qualitative phase behaviour of Hydrocarbon systems **9**

Calculation of liquid and vapour composition of Bubble point and Dew point pressure for multi component system, Equilibrium constant.Phase Definitions and the Gibbs Phase Rule, Equilibrium of H_2O and Hydrocarbon Systems Without Hydrates, Equilibrium of H_2O and Hydrocarbon Systems With Hydrates

UNIT 4: Hydrocarbon Fluid Characteristics **9**

Gas information volume factor, Gas solubility, Oil formation volume factor, Viscosity., Types of Gas Reservoirs: Characterizations by phase diagrams- Gas properties calculations Dry gas properties- Wet gas and condensate gas (above DP) properties (recombination calculations) Condensate gas properties below DP

UNIT 5: Properties of mixtures **9**

Dalton Law Volumetric analysis of a gas mixture – apparent weight and gas constant – specific of a mixture – determination of calorific values of fuels – oil and fuel vapour mixtures – steam condenser.

Total hours: 45

COURSE OUTCOMES:

CO-1: To clearly explain the differences between engineering and petroleum thermodynamics.

CO-2: To understand the PVT properties and heat transfer in reservoirs.

CO-3: To have a fundamental awareness on the petroleum chemical thermodynamics.

CO-4: To understand the entropy, enthalpy potential in petroleum reservoirs.

CO-5: To be well versed with qualitative phase behavior of petroleum systems.

CO-6: To be aware of Gibbs phase rule, thermodynamic equilibrium, and hydrates formation.

CO-7: To characterize different petroleum fluids by using the principles of applied thermodynamics.

CO-8: To be well versed with the concepts of gas and oil formation volume factors.

CO-9: To understand and evaluate the properties of mixtures.

CO-10: To determine the fuels calorific value and vapor mixtures.

TEXT BOOKS

1. Smith J.M., H.C. Van Ness, M.M. Abbott, "Introduction to chemical Engineering Thermodynamics", Tata Mc. Graw – Hill publishing company limited, New Delhi, sixth edition, 2005.
2. John J.Mcketta Jr. "Advances in Petroleum Chemistry and Refining" - volume 9 (inter science publications) New york, 1983.

REFERENCE BOOKS

1. Jean Vidal, Thermodynamics Application in Chemical Engineering and the petroleum industry, Institute Francalsbupetrole publications, France 2003.
2. Stanley.I.Sandler, chemical and Engineering Thermodynamics' Willey, 1988.

15EPE032 Drilling operations &equipments 3 0 0 3

Course Objectives: The Main aim is to understand the Well Drilling Equipments. The objective of learning this subject is the students will understand the Drilling Process and Drilling operations, Drilling Equipments**,** Hydraulics and Kill Procedures.

UNIT I Drilling **9**

Drilling operations – Location to Rig. Release Well Bore Diagram, Crews – Operator – Drilling, contractor – Third Party Services – Rig Types – Land Types – Marine types, Mainoffshore fields, Challenges, Effects on environment

UNIT II Components **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 Uni-axial.

UNIT III Planning **9**

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

UNIT IV Hydraulics **9**

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 Shut down 9

Origin of Overpressure, Kick Signs, shut – in Procedures- Drilling—land or bottom-supported offshore rig and Tripping—land or bottom-supported offshore rig,Kill sheets, Kill Procedures, Driller's Methods – Engineer's Method (Wait and Weight)

Total hours: 45

COURSE OUTCOMES:

CO-1: To get an introduction about drilling operation and equipments.

CO-2: To be aware of drilling rigs and contractors.

CO-3: To be well versed with various components for oil and gas drilling.

CO-4: To understand the role of drill pipes and strings.

CO-5: To understand the well planning procedures.

CO-6: To clearly explain the differences between water and oil based muds.

CO-7: To understand the hydraulic systems in drilling rig.

CO-8: To understand the drilling obstacles and wellbore cleaning.

CO-9: To detect any signs of hazards like kicks and overpressure during drilling.

CO-10: To be aware of well shut-down and killing procedures.

TEXT BOOKS

1. Devereux, S., "Drilling Technology", PennWell Publishing Company, 1999.
2. Azar, J.J. and G. Rabello Samuel, "Drilling Engineering", PennWell Corporation, 1937.
3. Devereux, S., "Practical Well Planning and Drilling", PennWell Corporation, 1998.

REFERENCE BOOKS

1. Standard Handbook of "Petroluem and Natural Gas Engineering", 2nd Edition, William C Lyons, Gary C Pilisga, Gulf Professional Publishing.
2. Rabia.H., "Oil Well Drilling Engineering, Principles And Practices' Graham And Trotman Ltd. 1985
3. Fundamentals Of Formation Evaluation', OGCI Publications, 1983

15EPE033 Drilling Fluids & Cement 3 0 0 3

Course Objectives: The main aim is to understand the fundamentals of drilling fluids and cementing technology. 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 Introduction **9**

Introduction to the basic functions and properties of drilling fluids and cement slurries. Compositions and related properties of drilling fluids and cement slurries, Portland cement-general, cement chemical nomenclature and other abbreviations

UNIT II Fluids **9**

Functions of drilling fluids, composition of drilling fluids, properties of drilling fluids-flow properties, alkalinity, filtration properties, drilling fluid selection-location, geopressured formations, mud handling equipment, optimization.

UNIT III Cements **9**

Types of equipment and methods used in cementing operations.Drilling fluids – classification – water base drilling fluids. Testing of drilling fluids.Drilling fluid additives.Compositions of different forms of cements.Raw materials and manufacturing processes.

UNIT IV Analysis **9**

Determination of torque and drag.Calculation of cutting transport efficiency.Placement technique of cements.Gas migration through cement columns. Thermo-gravimetryand calcium hydroxide content.

UNIT V Cementing Procedures **9**

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

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand the basic function of drilling fluids.

CO-2: To understand the basic function of cementing process.

CO-3: To clearly explain the functions of water based drilling fluid.

CO-4: To understand the rheology of water based drilling fluid.

CO-5: To understand the working process of Portland cement.

CO-6: To be well aware of cement plugs.

CO-7: To calculate and determine the cutting transport efficiency, and mechanical balance.

CO-8: To be well versed with gas migration through cement columns
CO-9: To understand clearly about the cement chemistry.

CO-10: To be well versed with different stages of cementing.

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.

REFERENCE BOOKS

1. Mc.Cray. 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.

15EPE034 Formation Evaluation & Well Logging 3 0 0 3

Course Objectives: The main aim of the subject is to give an in depth knowledge about various methods of evaluating the drilled formations and understand the well logging theory and practicing methods. 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 Formation of wells **9**

Definitions of Formation, GTO, cuttings and cores, sampling, testing methods, mud logging/Geo-logging units. Borehole conditions, fundamentals of borehole geophysics, reservoir rock properties, formation parameters, porosity, permeability, resistivity, water and hydrocarbon saturations, movable oil, Archie's and Humbles equation.

UNIT – II Geological logs **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 Log Analysis **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 Log Inference **9**

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

UNIT – V Identification and Interpretation **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 hours: 45

COURSE OUTCOMES:

CO-1: To understand the necessity of formation evaluation and well logging.

CO-2: To have a general understanding about different methods involved in well formation.

CO-3: To be aware of geological logs.

CO-4: To be specifically well versed with gamma ray and nuclear magnetic logs.

CO-5: To analyze and interpret the log data.

CO-6: To specifically understand about the borehole geophysics for groundwater exploration.

CO-7: To understand clearly about the subsurface correlation and log data mapping.

CO-8: To analyze and calculate the general reservoir parameters such as porosity, permeability, and resistivity

CO-9: To understand and apply theoretical computations of lateral and normal log responses.

CO-10: To interpret the log data from oil and gas field.

TEXT BOOKS

1. Standard Handbook of “Petroleum and Natural Gas Engineering”. 2ndEdition,William C Lyons, Gary C Plisga. Gulf Professional Publishing.
2. Fundamentals Of Formation Evaluation”, OGCI Publications, 1983

REFERENCE BOOKS

1. Dewan.J.T “Essentials of Modern Open-Hole Log Interpretation”, Pen Well Books, 1983
2. Proceedings of the Seminar on Exploration Geophysics in India, February 1977, Hyderabad: Geophysical methods and techniques, “Geophysical Well Logging”

15EPE035 Natural Gas Engineering 3 0 0 3

Course Objectives: The main of learning this subject is that student will be able to understand the basics of Natural Gas engineering techniques. The objective of studying this subject is that student will be understanding the basic concept and applications of Natural Gas Engineering.

UNIT I Natural Gas **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 Properties of natural gas **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 Gas compression **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 Flow analysis **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 Analysis **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 hours: 45

COURSE OUTCOMES:

CO-1: To understand the origin of natural gas reservoir.

CO-2: To understand clearly about the sedimentation process and subsurface geothermic.

CO-3: To be well versed with natural gas physical and chemical properties.

CO-4: To understand the concept of equation of state and natural gas conversion processes.

CO-5: To acquire knowledge on gas compression systems.

CO-6: To make critical analysis on compressible flow of natural gas in pipes.

CO-7: To understand the natural gas transport in reservoir porous rocks.

CO-8: To be aware of radial flow of gases under both steady state and transient conditions.

CO-9: To understand the infinite reservoir and Pseudo steady state solutions.

CO-10: To clearly understand the different gas well deliverability tests.

TEXT BOOKS

1. Xiuli Wang, Michael Economides, "Advanced Natural Gas Engineering", 1st edition, 2006.
2. Katz D.L.et al., "Natural Gas Engineering" (Production & storage), McGraw-Hill, Singapore, 3rd edition, 2007.

REFERENCE BOOKS

1. Oilfield Processing: Crude Oil (Oilfield Processing of Petroleum R. Solvay, Pennwell Books 1995.
2. Standard Handbook of Petroleum and Natural Gas Engineering, William C Lyons, Gary C Plisga. Gulf Professional Publishing, 2nd Edition, 2004.

15EPE036 Drilling Fluids and cementing Lab 0 0 2 1

Course Objectives: To understand the basic concepts of Preparation of mud samples, mud density and mud balance. Also to determine the apparent and plastic viscosity and yield point of samples.To correlate the experimental results with the theoretical values.

List of Experiments:

1. Preparation of mud samples.
2. Determination of apparent and plastic viscosity and yield point of samples
3. Determination of mud density
4. Determination of mud balance
5. Determination of mud density – Hydrometer
6. Determination of marsh funnel viscosity
7. Sand content determination in drilling fluids
8. Determination of gel strength
9. Determination of pH of mud sample.

Total hours: 40

COURSE OUTCOMES:

CO-1: To calculate and determine the physical properties of drilling mud.

CO-2: To understand the Non-Newtonian behavior of mud.

CO-3: To calculate mud density

CO-4: To calculate gel strength and ph of mud sample

CO-5: to determine the apparent and plastic viscosity of samples.

15EPE037 Thermal Engineering Lab 0 0 2 1

Course Objectives: The student will learn the practical aspect of lithology, resistivity, determination of SP log, determination of log correlations, determination of porosity from logs, determination of saturation, identification of oil - water and gas - oil contacts etc., in this lab

COURSE OUTCOMES:

CO-1: To interpret different well logging plots.
CO-2: To determine the reservoir porosity and saturation

Total hours: 40

15EPE038 Core Analysis Lab 0 0 2 1

Course Objectives: In the core analysis lab the students will learn experimentally the properties of rocks, Identification of Minerals, Porosity Determination, determination of Permeability, Determination of Saturation etc.,

List of Experiments:

1 Identification of Minerals
2 Determination of Saturation, Dean-Stark distillation method
3 Measurement of fluid density using the pycnometer
4 Liquid viscosity measurement using capillary type viscometer
5 Porosity determination by liquid saturation method
6 Resistivity measurements of fluid-saturated rocks
7 Absolute permeability measurement of water
8 Contact angle measurement using imaging method
9 Capillary pressure measurement using centrifuge
10 Study of Rock Properties

COURSE OUTCOMES:

CO-1: To identify different minerals and rocks.

CO-2: To measure the physical properties of various fluids.

Total hours: 40

15EPE039 Reservoir Engineering II 3 1 0 4

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

UNIT I Introduction 12

Fluid characteristics.Introduction to the production system.Characteristics of the reservoir rocks. Porosity, Permeability cross plots. Fluid saturation, capillary pressure, gas material balance- recovery factor.

UNIT II Reservoir Flows 12

Multiphase flow: Relative permeability: fractional flow. Well performance – inflow performance, tubing performance. Derivation of the basic radial flow equation, conditions of solution.

UNIT – III Well testing 12

Well testing – Basic well testing theory – oil well testing: gas well testing – Practical well testing – Gas field reservoir engineering – Fluid phase behaviour – 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 Material balance techniques 12

Material balance techniques: Production forecasting – Gas condensate reservoir engineering Fluid phase behaviour development – options. Reservoir drive mechanisms, solution gas drive, gas cap drive.

UNIT – V Reservoir Simulation 12

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 hours: 48

COURSE OUTCOMES:

CO-1: Students can able predict the performance of the reservoir by interpretation of cross plots and stimulation techniques.

CO-2: Students can able to know to how do the production pattern changes based upon reservoir characteristics.

CO-3: They will acquire the knowledge of flow behavior in the reservoir system.

CO-4: They will get the knowledge about the performance of well based upon phases of fluid existing in the reservoir.

CO-5: They can able to get the knowledge of production potential of the reservoir through several tests.

CO-6: They can able to provide a idea to maintain the production level to meet the demands.

CO-7: Students can able to provide a detailed report on amount of reserves in the formation and the amount of fluids which can be recoverable economically.

CO-8: By mathematically they can able to provide a detailed report on fluid flow behavior based upon the reservoir pressure.

TEXT BOOKS

1. Ahmed, T, "Reservoir Engineering Handbook", 3rd Edition, Elsevier, 2006.
2. Slip Slider, H.C. "Worldwide Practical Petroleum Reservoir Engineering Method", Penn Well Publishing Company, 1983.
3. Amyx.J.W. et al. "Petroleum reservoir engineering" – Mc.Graw-hill-1998.

REFERENCE BOOKS

1. Gianluigichierici, "Principles of Petroleum Reservoir Engineering", Elsevier, 1994.
2. Archer.J.s and Wall C.C. "Petroleum engineering principles and practice", kluwer 1990.
3. Craft B.C. and Hawkins M.P. "Applied Petroleum reservoir engineering" 2-nd Edition Prentice hall – 1991.

15EPE040 Production Equipments& Operation 3 0 0 3

Course Objectives: The main of learning this subject is that student will be able to understand the basics of oil and gas production engineering techniques.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 Components **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 Well performance **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. Artificial lift systems. Horizontal well production.System analysis.Production Chemistry Basics (Wax, Scale, Corrosion, Emulsions).

UNIT III Equipments **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 Measuring system **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.Water disposal, corrosion.Water injection systems.Subsurface equipment**.**

UNIT V Analysis **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 hours: 45

COURSE OUTCOMES:

CO-1: It will provide knowledge about the various production operations for different kinds of reservoir and their applications

CO-2: To acquire the knowledge of influence of pressure in production equipments

CO-3: The students will get an idea about the production rate of reservoir existing at different phases and conditions of saturation.

CO-4: To understand the performance of well based upon variable conditions of reservoir existing in it.

CO-5: To acquire the knowledge in utilization of sub-surface system to meet the production rate at acceptable limit without interruption.

CO-6: To understand the working principle of surface equipments equipped in it and its application of different fluids.

CO-7: To impart knowledge in the design of surface equipments equipped for separation process.

CO-8: To create knowledge in the flow measurement systems lined up with various treatment processes for quality control.

CO-9: To make aware about the eradication of various problems and the equipments involved at treatment process.

CO-10: To create knowledge in the selection of completion techniques for different well based upon the formation.

CO-11: To analyze the flow performance of different wells at various conditions equipped at different technology for production.

TEXT BOOKS

1. S.Kumar,“Gas Production Engineering” Gulf publishing Co., - 1987.

2. T.E.W.Nind,“Principles of well Production”-2nd Edition.Mc.Grawhill Book-Co. Ltd, Newyork 1981.

REFERENCE BOOKS

1. T.O.allen and A.P.Roberts. “Production operations” –SPE - Vol-I, 4th edition, 2006.
2. Guo, B, Lyons, W.C. and Ghalambor, A., “Petroleum production Engineering- A computer assisted approach”, Gulf Professional Publishing, Burlington, 2nd edition, 2009.

15EPE041 Well Testing 3 1 0 4

Course Objectives: This course is to provide a working knowledge of the current methodologies used in well testing and the concepts of porosity and permeability. Also to estimate oil, gas, and water properties pertinent for well test analysis using industry accepted correlations and/or laboratory data.

Unit I: Introduction **9**

Role, History and uses of well test, Well test data acquisition, analysis, andmanagement, Selection of wells for optimum stimulationtreatment, Reservoir system characterization process, Scope and Objective of well test. Numerical models and their application, Well test and its types, well testing in different phases of well.

Unit II: Well testing methods and their analysis. **9**

Flow test, RFT, FIT, Drill Stem test, Drawdown test, Multi rate test, Pressure Build Up Test, Bankers Test, Interference test operation and their analysis and interpretation. Well testing methods for Horizontal well andNaturally fractured reservoirs

Unit IV: Well Test Interpretation **9**

Flow Equation, Well Test Interpretation model and its analysis, Radius of investigation, Skin, Well bore radius, Flow efficiency and Damage ratio; Production logging. Case study and Numerical problems.

Unit IV: Gas well testing **9**

Gas well testing: Pseudo Pressure, Pseudo time, AOF, Isochronal, modified Isochronal, interpretation and analysis.

Unit-V: Curve analysis of well test **9**

Decline curves; APRs equation, Harmonic, Hyperbolic, and Exponential Decline curves, Fetkovitch, Blasingame type curves.

Total hours: 45

COURSE OUTCOMES:

CO-1: This course will provide a knowledge about the performance of well at different conditions of reservoir for different flowing parameters.

CO-2: To get a basic concept about the testing of well at different phases to determine the performance of well based on its properties.

CO-3: To analyze the well performance by numerical simulation model for interpretation.

CO-4: To understand the methodology to conduct a well testing techniques for an oil well at different flowing conditions.

CO-5: To understand the importance of analyzing the well test data for effective performance of well.

CO-6: To create knowledge in relation to the interpretation of data to suggest remedial actions to maintain the performance of well.

CO-7: To acquire knowledge in concerning with the real time problems through case study.

CO-8: To understand the methodology to conduct a well testing techniques for gas well at different flowing conditions.

CO-9: To be aware of knowledge in interpreting the data for effective performance of well.

CO-10: To provide a detailed view on describing the future oil production on a field-by-field level.

CO-11: To carry out a reliable and reasonable forecast for essential planning for future production.

TEXT BOOKS

1. Bourdarot, G. "Well Testing, Interpretation Methods", 1 st Edition, 1996
2. Chaudhry AmanatU,"Oil Well Testing Handbook" Gulf Professional Publishing, 2004.
3. Lee W. J, "Well Testing", Textbook Series, SPE, Richardson, TX, USA, 1982

REFERENCE BOOKS

1. S. McAleese , "Operational Aspects of Oil and Gas Well Testing", Volume 1 (Handbook of Petroleum Exploration and Production) 1st Edition, 2004.
2. Horn R A, "Modern Well Test Analysis, A Computer Aided Approach", Petroway, Second edition, 1995.
3. Earlougher, R.C., "Advances in Well Test Analysis", Monograph Series, SPE,1977

15EPE042 Hydrocarbon Processing & Plant Engineering 3 0 0 3

Course Objectives: To impart knowledge about the selection and evaluation of processes used to dehydrate natural gas, meet hydrocarbon dewpoint specifications and extract NGLs. To learn about theapplication of gas engineering and technology in facilities and gas plants.

Unit I Concepts of Natural Gas Processing, Phase Separation 9

Introduction – process modules – scope of natural gas processing – phase separation – general description - gravity separator - description & design procedure of horizontal separator – selection of separator- advantages and disadvantages of horizontal separator – problems - description & design procedure of horizontal separator – advantages and disadvantages of vertical separator - problems

Unit II Condensate Stabilization &Compression 9

Introduction – process of condensate stabilization –introduction – types of compressors – selection of compressor – advantages of compressor – design procedure – power calculation, condensate hydrotreating, effluent treatment.

Unit III Acid Gas Removal **9**

Introduction – acid gas removal processes – design considerations – amine absorber – pumps – flash tank – reboiler – stripper – condenser – lean/rich exchanger – cooler – declaimer – design procedure

Unit IV Dehydration **9**

Introduction – water content determination – solid desiccant – selection and characterize of desiccant- process – design procedure, glycol dehydration, solid-bed dehydration, gas dehydration process selection.

Unit V VNGL's **9**

Introduction – process- operation – types – design of Fractinator, recovery technology development, recovery unit design considerations, recovery unit operating problems, refrigerations, recovery processes

Total hours: 45

COURSE OUTCOMES:

CO-1: To impart a knowledge in concerning with the concepts and importance of natural gas

CO-2: To create knowledge of separation technique's by effective design of various separator.

CO-3: To aware about the process of making a condensate from natural gas

CO-4: To provide a detailed report on design and selection of compressors and its power calculations.

CO-5: To impart a knowledge of acid gas removal techniques

CO-6: To impart a detailed report on design considerations of equipments involved in it.

CO-7: To create an awareness to remove the water and moisture by dehydration process
CO-8: To impart a method to selection and design the process of dehydration method by solid desiccant

CO-9: To emphasize the detailed study of fractionalization to separate the elements

CO-10: To emphasize an importance to the design principle of fractinator

CO-11: To create detail knowledge about the processing techniques and its application to extract natural gas by plant engineering.

TEXT BOOKS

1. KatzD.L. "Natural Gas Engineering(Production &storage)", Tata McGraw-Hill, Singapore, 4th edition, 2009.
2. SmithJ.M, " ChemicalEngineeringKinetics", Tata McGrawHill Publications, 6th edition, 2002.
3. Blake,R.P,"IndustrialSafety", PrenticeHall,1953.

REFERENCE BOOKS

1. C.G., “AnIntroductionto Chemical Engineering Kinetics &Reactor Design”, John Wiley, 2nd edition, 2002.
2. FoglerH.S., “ElementsofChemicalReaction Engineering”, PrenticeHallofIndia, 5th edition, 2009.

15EPE043 Heat & Mass Transfer 3 0 0 3

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

UNIT I: Introduction **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. Difussional 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: Heat Transfer **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: Heat Exchangers **9**

Parallel 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: Mass Transfer **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 Liquids Distillation methods **9**

Vapour liquid equilibria – Raoult's law, Vapour 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 hours: 45

COURSE OUTCOMES:

Upon completion of this course, the students will be able to understand:

CO-1: Basic heat transfer mechanisms (conduction, convection and radiation).

CO-2: Heat transfer by conduction in solids for steady-state and transient conditions.

CO-3: Heat transfer by convection in closed conduits and on external surfaces.

CO-4: Heat transfer by thermal radiation.

CO-5: Convective mass transfer.

CO-6: Friction and pressure loss in boundary layer flows in closed conduits and external surfaces.

CO-7: Heat transfer with phase change (boiling and condensation).

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.

REFERENCE BOOKS

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.

15EPE044 Linear and Numerical Programme 3 0 0 3

Course Objectives: To know about various types of Errors, Calculate the error correction and get actual root of the equation, Understand different methods of solution of the equations and compare them. Students will be made aware of different numerical and statistical methods which are used in engineering field, with emphasis on how to prepare program for different methods.

UNIT I System of linear equations **9**

Introduction – Formulation of the problem – Graphical Method – Some exceptional cases – General linear programming problem – Canonical and standard forms of L.P.P., matrix operations, identity and inverse matrices.

UNIT II Linear programming **9**

Simplex mthod, Artificial variable techniques – M- Method- Duality concept – Duality principle – Dual Simplex method, Examples-A production problem, a diet problem, a transportation problem, two fundamental facts about standard and symmetric primal-dual pairs.

UNIT III Transportation problem **9**

Transportation problem (T.P) – historical summary, elementary transportation theory, working procedure for Transportation Problem – Degeneracy in Tranportation problem – Assignment Problems (A.P)

UNIT IV Ordinary differential equations **9**

Introduction – linear equations of the first order-linear equations with constant coefficients- Picard's method – Taylor's series method – Euler's method –modified Euler's method – Runge's method – Runge – Kutta method.

UNIT V Predictor & Corrector methods **9**

Predictor – Corrector methods: Milne's method – Adams – Bashforth method – Simultaneous first order differential equations – second order differential equcations – Boundary value problems- Finite difference method.

Total hours: 45

COURSE OUTCOMES:

CO-1: Be aware of the use of numerical methods in modern scientific computing.

CO-2: Be familiar with finite precision computation

CO-3: Be familiar with numerical solutions of nonlinear equations in a single variable

CO-4: Be familiar with numerical interpolation and approximation of functions,

CO-5: Be familiar with numerical integration and differentiation

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Balagurusamy,E.,"NumericalMethods",TataMcGraw-HillPub.Co.Ltd,NewDelhi,1999.

3. S.C. Malik and SavitaArora: Mathematical Analysis, New Age International (P) Ltd. Publishers, 1996.

REFERENCE BOOKS

1. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

15EPE045 Reservoir Engineering Lab 0 0 2 1

Course Objectives: To understand various products derived from crude oil, to analyze and solve practical problems Reservoirs- drilling, completion, workover and production field practices and provide solution by designing appropriate systems.

List of Experiments:

1. Interpretation and determination of oil viscosities from Reservoir data.
2. Determination of reservoir heterogeneity
3. Determination of gas compressibility
4. Determination of Bubble Point pressure
5. Construction of Relative permeability graphs
6. Estimation of vertical sweep efficiency at breakthrough
7. Determination of stabilized flow rate through IPR and TPR.
8. Familiarization of reservoir engineering software.

Total hours: 40

COURSE OUTCOMES:

CO-1: To create an idea about the flow of hydrocarbon within the reservoir based upon the viscosity of the fluid.

CO-2: To get an information about the properties of the reservoir heterogeneity

CO-3: To get a clear idea about the gas deliverability of the reservoir through compressibility factor

CO-4: To emphasize the importance of permeability in flow through by constructing permeability charts

CO-5: To get an idea about the variation in production rate through by IPR and TPR

15EPE046 Petroleum Testing Lab 0 0 2 1

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

List of Experiments:

1. Aromatioc content Determination
2. Carbon residue determination
3. Karl-Fisher Conductometer Apparatus for water estimation
4. Foaming characteristics of tube oil
5. Mercaptan as sulphur estimation
6. Corrosion testing of petroleum oils and copper
7. Freezing point of Aqueous Engine coolant solution
8. Automatic Vaccum Distillation
9. Characteristics of Hydrocarbon types in Petroleum products
10. Coking tendency of oil
11. Sayboltcolor of petroleum products
12. Water separately of Petroleum products.

Total hours: 40

COURSE OUTCOMES:

CO-1: To create a awareness about the variation in properties of the fluids on the basis of aromatics compounds

CO-2: To provide a knowledge about the formation of carbon deposits at high temperature

CO-3: To provide an estimation of amount of water particles in the petroleum sample.

CO-4: To create an awareness about the presence of sulphur content in the fluid sample

15EPE047 Heat & Mass Transfer Practical 1 0 2 2

Course Objectives: This course is to introduce the basic principles of heat and mass transfer with emphasis on their analysis and applications to practical engineering problems. Also to identify important thermal processes, and derive the basic expressions for heat conduction, convection and radiation based on the First Law of Thermodynamics.

List of Experiments

1. Heat Transfer from a Pin-Fin Apparatus
2. Heat Transfer through Composite Wall
3. Critical Heat Flux
4. Emissivity Measurement Apparatus
5. Heat Transfer through the Lagged Pipe
6. Thermal Conductivity of Metal Rod
7. Heat Transfer in Natural Convection
8. Parallel Flow / Counter Flow Heat Exchanger
9. Heat Transfer in Forced Convection

Total hours: 40

COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO-1: Explain about the real time applications of solid medium heat transfer.

CO-2: Describe the real time applications of fluid medium heat transfer.

CO-3: Express the knowledge of design skills of heat exchangers.

CO-4: Illustrate the real time applications of radiation mode of heat transfer (no media).

CO-5: Relate the skill of mass transfer and its applications.

15EPE048 Reservoir Modeling, Simulation & Management 3 0 0 3

Course Objectives: The main of learning this subject is that student will be able understand the Basic reservoir characterization, modelling and simulation methods used in oil industry.The objective of this subject is that student will be able to follow and utilize the different concepts of reservoir modelling and characteristics and theirusage.

UNIT – I Introduction 9

Overview of reservoir characterization and modelling problems.Reservoir mapping.3D modelling.Univariate, bivariate and multivariate statistics for geological data analysis.Pattern recognition techniques.Petrophysical predictions from well logs.Introduction to petroleum geostatitsics.Variograms, Kringin, Uncertanity quantification.

UNIT – II Reservoir modeling 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. 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 – III Reservoir characterization 9

Pressure transientinterprétation. Seismicréservoircaractérisation.Log management, correlation and petrophysical analysis.Geology correlator probe–AVO Reservoir Characterization.Software used in reservoir characterization and modeling.

UNIT – IV Reservoir management 9

Concepts of reservoir Management – definitions, objectives of management, synergy and team efforts – International business management of joint ventures.Reservoir Management process- Setting goals, developing plan and implementation, Managerial economics, Estimation of production potential.

UNIT -V: Flow assurance 9

Flow assurance – Identifications of drive mechanism – Bottom hole pressure Management – Forecasting economic scenario.Dynamic reservoir modelling – concept of relative permeability – PVT relationships – Phase behavior – Reserve estimation for identified prospects.

Total hours: 45

COURSE OUTCOMES:

CO-1: To emphasize the characterization of reservoir from geological data to model the reservoir
CO-2: To create an awareness about the influence of petro-physical properties and geostatistical data to model the reservoir

CO-3: To provide an knowledge about the importance of modeling the reservoir through by various techniques

CO-4: To provide an information concerning the importance of reservoir properties in modeling the reservoir

CO-5: To emphasize the reservoir characterization by specific tools to analyze the reservoir by its petro-physical properties

CO-6: To provide an hands on training to characterize the reservoir through software's

CO-7: To create awareness about the basic concepts of reservoir management

CO-8: To get a clear idea about the production potential of the reservoir through managerial economics

CO-9: To provide a knowledge about the reservoir drive mechanisms in view of flow assurance

CO-10: To emphasize the concepts and its behavior of reservoir in concerning with phase behavior and PVT relationship

TEXT BOOKS

1. John R. Fanchi, "Principles of Applied Reservoir Simulation", 3rd Edition, 2006.
2. Moody, G.B. Slip Slider, H.C. "Petroleum Exploration", Hand Book "World wide Practical Petroleum Reservoir Engineering Method",PennWell Publishing Company, 1983.

REFERENCE BOOKS

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

15EPE049 Enhanced Oil Recovery & Water flooding 3 0 0 3

COURSE OBJECTIVES: 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.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 Introduction **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 Miscible Displacements **9**

Miscible Displacements- Miscible Slug Process, Enriched-Gas Drive, High-Pressure Gas Injection- Nitrogen and Flue Gas Flooding- CO_2 Miscible Process**,** Laboratory Designs for a CO_2 Flood,Criteria for gas injection.

UNIT III Oil Recovery **9**

Chemical oil recovery methods – Polymer Flooding, Foam Flooding, Surfactant/ MP Flooding, Alkaline flooding, ASP Flooding, Laboratory design for Chemical Flooding, Criteria for chemical recovery methods.

UNIT IV Combustion **9**

Thermal recovery – In-Situ Combustions- Dry Forward Combustion, Reverse Combustion, Wet Combustion, Steam Injection Processes-Screening criteria for steam flood prospects, Oil recovery calculations of Steam Displacement, Mechanism of Steam Stimulation and Steam Displacement– criteria for thermal methods, Steam Assisted Gravity Drainage.

UNIT V EOR Methods **9**

Microbial EOR methods (MEOR)-Definition and Classification of MEOR- Cyclic microbial recovery. Microbial Flooding, Mechanisms of MEOR, Advantages and disadvantages of MEOR

Total hours: 45

COURSE OUTCOMES:

CO-1: To create a information about the basic concepts of Enhanced Oil Recovery Mechanisms

CO-2: To provide a detailed knowledge about the various EOR techniques followed in oil and gas industry

CO-3: To emphasize the concepts of miscible displacement of hydrocarbon and its application of it

CO-4: To emphasize the design concepts and selection criteria of CO2 flooding

CO-5: To emphasize the concepts of chemical oil recovery method and its application of it

CO-6: To emphasize the design concepts and selection criteria of chemical oil recovery method

CO-7: To emphasize the concepts of thermal recovery methods and its application of it

CO-8: To emphasize the design concepts and selection criteria for Steam Assisted Gas Drainage and Cyclic Steam Stimulation process

CO-9: To emphasize the concepts of microbial oil recovery method and its application of it

CO-10: To emphasize the design concepts and selection criteria of microbial oil recovery method

TEXT BOOKS

1. Von Pollen. H.K. and Associates. Inc., “Fundamentals of Enhanced oil Recovery” – Penn Well publishing co., Tulsa -8th edition,1980.

2. Latil.M. et al., “Enhanced oil recovery” – Gulf publishing co. Houston, 3rd edition, 1980.

REFERENCE BOOKS

1. Donaldson-Erle, “Enhanced Oil Recovery-II, Processes and Operations”, 7th edition, 2006.
2. William C.Lyons& Gary J.Plisga, “Standard Hand Book of Petroleum & Natural Gas Engineering”, Gulf professional publishing comp, 2nd Edition, 2005.

15EPE050 Pipeline Engineering 3 0 0 3

Course Objectives: Objective and scope of pipeline engineering is to understand the process of fluid transportation with special reference to crude oil/gas/refined products, its construction and maintenance, economics of Pipeline transportation.

UNIT I Design of Pipeline 9

Factors influencing oil, gas and refined products as pipeline design; Hydraulic surge and water hammer; specific heat of liquids; river crossing; pipe size and station spacing etc, load constructions, performance analysis and design

UNIT II Fluid Flow 9

Theory and different formulae of the flow of fluids in oil/gas pipelines; basic equations for the flow of fluids through pipes; different flow equations for laminar and turbulent flow of compressible and incompressible fluids(Newtonian); Introduction to the flow of Non-Newtonian fluids through pipes; multiphase flow and loop pipelines.

UNIT III Construction and Maintenance of pipelines 9

Route location survey, materials; project specifications; general equipment specifications (Pipes, valves and fittings); Installation of expansion loops and thermodymetric tapping plant. Pigging, Pigging Technology: pig launcher and receiver, intelligent pigging, types of pigs.

UNIT IV Offshore Pipeline 9

Design and control of Sag and Over bend; Description of stinger; and Riser, articulated stinger, construction of offshore pipeline, Method of underwater welding, offshore construction,

UNIT V Hydrates, Wax & Scale 9

Formation and prevention of hydrates,wax and scale,Crude conditioning and use of additives to improve flow conditions, inhibition and remediation of hydrates, scale, paraffin of wax, strategies for controlling the solids.

Total Hours: 45

COURSE OUTCOMES:

CO-1: To identify the basic vocabulary and to introduce the major concepts of piping system design

CO-2: To provide & understand the basic piping requirements for design as per the international codes & standards

CO-3: To understand how to design cost effective new installation

CO-4: To understand how to create cost effective design in trouble shooting as well as while improving existing piping system.

TEXT BOOKS

1. "Subsea Pipeline Engineering", 2nd Edition, Pennwell corporation, 2008
2. Boyun Guo, Shanhong Song, Ali Ghalambor, and Tian Ran Lin, Offshore Pipelines, 2nd edition, Elsevier, 2014.

REFERENCE BOOKS

1. Piping and Pipeline Engineering: Design, Construction, Maintenance, Integrity, and Repair", CRC Press, 2003.
2. M. Mohitpour, H. Golshan, A. Murray, "Pipeline Design and Construction: A Practical Approach, 3rd edition, 2007.

15EPE051 Petrochemicals & Petroleum Refining 3 0 0 3

Course Objectives: To provide awareness to Petroleum Refining and Petrochemicals. 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 Introduction **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 Processing **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 Synthesis **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 Unit Processes **9**

Alkylation-alkylation reactions, process variables, alkylation feedstocks, alkylation products, catalysts, Oxidation, Dehydrogenation, Nitration,Chlorination, Sulphonation and Isomerisation.

Unit V Polymerisation **9**

Monomers, polymers and copolymers, classification of polymers, plastics, condensation polymerization, Models and Techniquies, production of polyethylene, PVC, Polypropylene, SAN, ABS, SBR, Polyacrylonitrile, Polycarbonates, Polyurethanes, Nylon, PET

Total hours: 45

COURSE OUTCOMES:

CO-1: To impart a knowledge about the basic concepts of petroleum system and production techniques

CO-2: To impart knowledge about the downstream activities performed in oil and gas industry

CO-3: To emphasize a detailed study on the basic activities performed in the processing plant
CO-4: To create knowledge concerning with the advanced and specific processes involved in processing plant

CO-5: To create an importance about the catalyst and catalytic reaction in synthesis of petroleum products

CO-6: To provide a detailed study on synthesis and separation of petroleum products

CO-7: To impart knowledge about the basic concepts of unit process involved in it

CO-8: To impart a specific knowledge about the various aspects of unit processing techniques in refining plant

CO-9: To impart knowledge about the basic concepts of polymerization in refining plant

CO-10: To impart a specific knowledge about the model and techniques of polymerization in refining plant

TEXT BOOKS

1. B.K. BhaskaraRao,“Modern Petroleum Refining Processes”, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi, 3rd edition, 2008.
2. Groggins, “Unit Processing in Organic Synthesis”, Tata McGraw Hill, Edition 5, 1987.

REFERENCE BOOKS

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

15EPE052 HSE & Hazards Management 3 0 0 3

Course Objectives: The course will give an overview of the safety and environmental issues in the petroleum industry. It will provide detailed understanding of the methods and techniques to resolve these key issues for making petroleum production and processing, cleaner and safer. This course would educate the students to identify and assess hazards in any stage of operation, to quantify and manage them as well.

UNIT I: Introduction to pollution **9**

Pollution – air pollution, water pollution, land pollution, noise pollution, Hazards – natural and man made. Hazards materials used in oil industry, Environmental impact and its consequences, Acts related to pollution.

UNIT II: Risk Assessment & Management **9**

Waste discharge in on shore and offshore operations, their impact on environment, toxicity, heavy metals, chemicals, drilling fluids, produced water, radioactive elements cuttings and fluid disposal methods, effluent treatment, gas flaring.

UNIT III: Safety assurance and assessment **9**

Lost circulation zones, differential stuck up, sticky clay, well deviation, high pressure zones, blow-outs, Safety measures. Gas hydrates-high pressure, very low temperatures, drilling hazards.

UNIT IV: Environmental issues and management **9**

Oil Storage methods at drill site, ground water contamination, well abandonment methods and cite restoration, oil spill and leak, remedial measures. Offshore facilities, - hazards and environmental problems.

UNIT V: Safety measures in design and operation **9**

General, obligations of the owner, operator or Contractor, Safety measures during drilling, logging, production & transportation regulatory procedures and mines act Environment Impact Assessment report case studies.

Total hours: 45

COURSE OUTCOMES:

CO-1: To provide a basic concepts of pollution and types of pollution

CO-2: To provide a detailed study on hazards and its environmental impact

CO-3: To emphasize the impacts on environment from the waste discharged from oil and gas industry

CO-4: To emphasize the various solid waste disposal methods and effluent treatment methods.

CO-5: To impart knowledge about the safety measures involved in it.

CO-6: To impart knowledge in assessing the hazards for various operations in it.

CO-7: To provide a detailed study on the problems that causes a direct impact on environment.

CO-8: To provide a detailed study on the remedial measures for the hazards involved in it.

CO-9: To create knowledge in the aspect of safety measures based on regulatory bodies

CO-10: To impart knowledge in environment impact assessment by several case studies

TEXT BOOKS

1. Boesch D.F and Rabalis Nancy, "Long term environmental effects of offshore oil and gas developments", 7th edition, 2003.
2. "Environmental control in Petroleum Engineering" by Reis J.C, Gulf publications, 5th edition,1968

REFERENCE BOOKS

1. KatzD.L. "Natural Gas Engineering(Production &storage)",TataMcGraw-Hill, Singapore, 6th edition, 2007.
2. SmithJ.M, " ChemicalEngineeringKinetics", McGrawHill, 3rd edition, 1981.
3. Blake,R.P,"IndustrialSafety", PrenticeHall,3rd edition, 1953.

15EPE053 Well Design & Completions 3 0 0 3

Course Objectives: To understand the basics of Design and Completion techniques of a well. The objective of studying this subject is that student will be able to design and complete the Well Operation during the hydrocarbon Explorations.

UNIT I Introduction **9**

Prediction of formation of pore pressure, Causes of abnormal pressure, Abnormal pressure evaluation, Formation integrity test, Fracture gradient determination, geomechanical evaluation, well issues.

UNIT II Casing properties **9**

Casing properties: functions of casing, Casing properties, Casing specifications, Casing connections, Casing Design principles: Data collection, Factors of influencing casing design, design criteria, Cementing, Drilling Fluids.

UNIT III Drill bits **9**

Drill Bits: Bit selection guide lines, IADC Bit classification for Roller cone Bits, PDC Bits, Diamond and TSP Bits, Drilling cost calculation, Drill String Design: Drill pipe selection, BHA selection, Drill string design criteria, Directional Drilling.

UNIT IV Types of wells **9**

Horizontal and Multi lateral wells: Horizontal wells, Extended Reach wells, Multi lateral wells, Multi lateral well planning consideration, HPHT wells, well costing.

UNIT V Well completion **9**

Well Completion: Definition of Well Completion, Types of completion, Open Hole or Barefoot Completions, Perforated Completions, Naturally Flowing Completions, Artificial Lift Completions, Artificial Lift Methods, Single Zone Completion, Multiple Zone Completions, Phases of Well Completion, completion selection and design criteria.

Total hours: 45

COURSE OUTCOMES:

CO-1: To provide basic concepts of pressure and the importance of pressure involved in it.

CO-2: To provide a detailed knowledge about the pressure for designing a well

CO-3: To impart knowledge about the casing and its types and its specifications

CO-4: To impart a knowledge in selection of casing and the factors influencing the casing design

CO-5: To create a knowledge concerning with the drill bits and its types and IADC classification of roller cone drill bits
CO-6: To create a knowledge concerning with the selection of BHA and design criteria for drill string.

CO-7: To emphasize a detailed study on planning considerations for different types of wells

CO-8: To emphasize a detailed study on well costing for different types of wells

CO-9: To aware about the completion techniques and its types followed in industry

CO-10: To aware about the selection, design and phases of completion techniques

TEXT BOOKS

1. ChaudhryAmanatU,“Oil Well Testing Handbook” Gulf ProfessionalPublishing, 2004.
2. Earlougher, R.C., “Advances in Well Test Analysis”, Monograph Series, SPE,1977.

REFERENCE BOOKS

1. Devereux, S., “Practical Well Planning and Drilling”, PennWell Corporation, 1998.
2. Lee W. J, “Well Testing”, Textbook Series, SPE, Richardson, TX, USA, 1982

15EPE054 Petroleum Engineering Practical VI (Reservoir Modeling) 0 0 2 1

Course Objectives: To understand various products derived from crude oil to analyse and solve practical problems in reservoir modeling,completion, workover and production field practices and provide solution by designing appropriate systems.

List of Experiments

1. Construction of histograms from Univariant analysis
2. Construction of histograms from Bivariant analysis
3. Construction of histograms from Trivariant analysis
4. Construction of variograms and interpretation
5. Krigging and solving weights
6. Gaussian estimation methods for solving variables
7. Approximation of unknown variables by FDA.
8. Pressure transient analysis & interpretation
9. Determination of foldage from given data
10. Familiarization of modeling softwares.

Total hours: 40

COURSE OUTCOMES:

CO-1: To emphasize the characterization of reservoir from geological data to model the reservoir

CO-2: To create an awareness about the influence of petro-physical properties and geostatistical data to model the reservoir

CO-3: To provide an knowledge about the importance of modeling the reservoir through by various techniques

CO-4: To provide an information concerning the importance of reservoir properties in modeling the reservoir

CO-5: To emphasize the reservoir characterization by specific tools to analyze the reservoir by its petro-physical properties

15EPE055 Minor Project (Casing and Well Design) 0 0 2 1

Course Objectives: To develop student's ability to understand and carry out project work on a chosen topic independently and submit for evaluation. This will enhance the students independent thinking and research work.

The students will be allotted minor project from the department and they will have to complete the project and submit the report for evaluation.

COURSE OUTCOMES:

CO-1: Students will be trained on how to maximize well efficiency.

CO-2: The ability to increase production by both minimizing production risks and maximizing reliability.

CO-3: Good expertise on well design analysis, production improvement , cost reduction of customer well will be developed.

15EPE056 Standards of Training, Certification and Watch-keeping 0 0 2 0

Standards of Training, Certification and Watch-keeping (STCW)

1. **Personal Safety and Social Responsibilities**
   A classroom-based course covering basic induction training in safety procedures and accident prevention, it also familiarises novices with the employment conditions and working environment on board.

2. **Fire Prevention and Fire Fighting**
   Outlines precautions for minimising the risk of fire, the causes of fires and how to extinguish them. Also practical training using fire fighting equipment and breathing apparatus to extinguish various types and sizes of fires.

3. **Personal Survival Techniques**
   Teaches the actions to be taken by individuals to protect themselves in emergency situations and includes practical training using life jackets and inflatable life rafts.

4. **Elementary First Aid**
   A combination of theory and practical training for basic first aid and life-saving skills.

5. **Proficiency in Security Awareness**
   Providing knowledge, understanding and proficiency to personnel intending to work on ships who will not have any designated security duties.

Total hours: 40

COURSE OUTCOMES:

CO-1: Discuss and describe the scope, purpose, and organizational structure of fire and emergency services.

CO-2: Describe the common types of fire and emergency service facilities, equipment, and apparatus.

CO-3: Students will be provided with a strong understanding on the types of lifesaving appliances carried on ships, survival craft's equipment, personal lifesaving equipment.

CO-4: Understand how to minimise the risk of infection to self and others, and how to safe use of first aid equipment.

CO-5: Students will be able to perform a preliminary first aid and complete an accident report form.

15EPE057 Petroleum Economics 3 0 0 3

Course Objectives: The course provides a comprehensive and up-to-date assessment of upstream petroleum economics, and an introduction to economics analysis of global warming, the potential roles of government and implications for energy markets.

Unit I: Introduction to Petroleum Economics 9

Supply and demand Curve Analysis, Types and utility in production forecast, Reserves to Production Ratio, Statistical analysis, Hubert curves. Reserves auditing, standard practices for reporting of reserves. SEC/ SPE/WPC norms.

Unit II: Oil Supply and Demand Curves and Price Determination 9

Crude oil characteristics, Marketing and trading of crude oil, Crude oil pricing mechanism and oil price elasticity, Inflation and effects on oil pricing. Factors controlling oil and gas pricing. Oil differential and influence on price of oil.

Unit III: Pricing and competition 9

Time value of money, types of costs, Economic Yardsticks: Return on Investment, Payout Period, Net Present Value, Discounted Cash How, DCFROR, Incremental Analysis, Replacement Analysis, Sensitivity analysis, Optimization. Ranking of projects based on economic parameters.

Unit IV: Empirical Methods in Energy Economics 9

Definition, Exploration and Production Probabilistic Analysis, Risk Analysis, Management and Economic Assessment, Biding processes, NELP and Production sharing contracts, Decision Analysis, Preference Theory, Real Option Theory, Stochastic Modelling.

Unit V: Issues in Petroleum Economics 9

Petroleum Industry Accounting and types, Petroleum Auditing, Tax Analysis, Cost, Expenditure and revenues under different heads and their proportion in Asset. Depreciation, Depletion, Amortization Methods and their use in tax calculations.

E and P Business in world and India, Historical development, Role of OPEC and non OPEC countries. Reasons for development of a fiscal system for petroleum industry. Classification of Petroleum Fiscal Systems.

Total hours: 45

Course Outcome:

CO–1: Describe the different types of energy resources (conventional, unconventional, renewable & fossil)

CO–2: Interpret the evolution of the factors affecting the energy supply and demand (crude prices, technology, reserves, geopolitics, geography, environment, etc.)

CO–3: Identify the actors of the energy scene and their strategic guidelines.

CO–4: Describe the main steps of the upstream sector.

CO–5: Distinguish the different types of oil contracts and explain the main economic criteria to evaluate a project.

CO–6: Summarize the operation of the physical and financial oil markets.

CO–7: Explain the evolution of the refining sector and of the petroleum product markets.

TEXT BOOKS

1. Abdel A. A., Bakr A. B, and Al Sahlawi M. A., “Petroleum Economics and Engineering”, Decker Publications, 1992.
2. Johnston, D, “International Exploration Economics, Risk, and Contract Analysis”, Penwell Books, 2003.
3. “IFP, Oil and Gas Exploration and Product ion, Reserves, Costs and Contracts”, Technical Publication 2007.

REFERENCE BOOKS

1. Mian M A, Project Economics and Decision Analysi s, Penwell-publications,Volume I and II, 2002.
2. Seba R. D., “Economics of Worldwide Petroleum Production”, OGCL-Publications, USA, 1998.

15EPE058 Offshore Drilling & Production 3 0 0 3

Course Objectives: This course provides a technical overview of the phases, operations, and terminology used in the drilling and completion of an offshore oil or gas well. The course will also provide students with a better understanding of the issues faced in all aspects of drilling operations, with a particular focus on the unique aspects of offshore operations.

Unit-I: Physical Environment **9**

Overview of physical ocean environment, geotechnical aspect –sea floor marine soils, composition and properties of sea water, seawater corrosion, offshore rigs, floating drilling vessels, comparison, fixed offshore structures, wind, wave, current and other forces acting on offshore structures, principle motions, metacenter, stability calculations, ballast control, Rov’s.

Unit-II: Field Operations **9**

Station keeping, conventional mooring system, spread mooring system, design considerations, operations, equipment and functions, Dynamic positioning system, components, working. Deepwater drilling operations, riser system, components, riser tensioners, heave compensator, operations, emergency disconnect and hang off. Floater well control, shut in procedures, well kill operations, subsea well head, BOP stack

Unit-III: Deepwater Drilling **9**

Deepwater well const ruction problems and solutions, deepwater cementation, high temp. High pressure wells, construction, casing and mud policy. Drilling logs, gas hydrate problems. Wellbore stability and rock mechanics, Mohr’s coulomb criteria 2D-3D system, insitustress, poissions ratio, mud window for vertical, horizontal deep water drilling.Case studies.

Unit-IV Development and Production **9**

Risers for Production operations, deepwater completion, Subsea completion, planning, tree selection, design considerations of offshore platform, production and processing of oil and gas, separators, design and planning to stage separation, selection, specification and operations, production

monitoring and control system. Multilayer producing fields, EOR, offshore field development considerations in deepwater.

Unit-V: Handling and Transportation **9**

Offshore storage, handling and transportation of oil and gas tankers**,** vessels andbuoys.Structural considerations functions and operations.Loading conditions, selection specification and operational aspect.Advantages and disadvantages. Sub-sea oil and gas lines – Design, construction, installation (laying methods), J-tube installation, and pressure drop calculations for two phase flow including riser behavior. Economics and logisticconsiderations in exploring, drilling, production, transport and reservoir management. Offshore support vessels, their roles, types, capabilities including fire fighting, pollution control, Different types of barges and their operations. Offshore vessel mounted cranes.

Total hours: 45

Course Outcomes:

CO–1: Provides a non-technical overview of the phases, operations, and terminology used in the drilling and completion of an offshore oil or gas well.

CO–2: The course will provide participants with a better understanding of the issues faced in all aspects of drilling operations, with a particular focus on the unique aspects of offshore operations.

CO–3: The course is focused on drilling and related operations on bottom founded drilling units. These include jackups, fixed production platforms (jackets), swamp barges, tender rigs, and gravity based structures (GBS).

CO–4: The course also covers additional issues that arise in floating drilling operations, topics including completions, directional drilling, offshore support operations, and offshore production concepts.

CO–5: Summarize wellbore trajectory control in production zones.

CO–6: Ability to provide a broad understanding of research, engineering and management aspects related to geo-steering.

CO-7: This innovative course is specially designed to train tomorrow drilling and well engineering experts.

TEXT BOOKS

1. R. Stewart Hall, “Drilling and producing offshore”, Pennwell books, 1st edition, 1983.
2. BencGerwickJr, “Construction of Marine and offshore structures”,IDT ONGC Dehradun, drilling operations manual.

REFERENCE BOOKS

1. Chakraborty S.K, “Handbook of offshore engineering volume I and II”, Elsevier, 2006.Exxon Mobil,“Floating Drilling School, Deepwater”, 5th edition, 2002.

2. Total Fina Elf, “Deepwater reference book”, 4th edition, 2000.

15EPE059 Unconventional Hydrocarbon Resources 3 0 0 3

Course Objectives: To give comprehensive view of unconventional oil and gas resources and their exploration. Also to understand the place of oil and gas in the domestic and international energy landscape and debate the future of oil and natural gas in the world economy.

UNIT I: Overview of Hydrocarbon Resources 9

Definition of unconventional hydrocarbons – shale gas, coal bed methane, gas hydrates, heavy oil, oil shales, difference between conventional and unconventional resources, carbonate fracture.

UNIT II: Heavy Oil 9

Heavy oil – origin, properties, characteristics, types, generation, occurrence, geology, exploration and evaluation, development and production of unconventional oil, thermal and non thermal recovery methods.

UNIT III: Shale Reservoirs (Gas and Oil) 9

Shale gas, basin centered gas and coal bed methane-origin, origin, properties, characteristics, types, generation, occurrence and geology, evaluation and exploration, techniques for shale gas development

UNIT IV: Production and Development 9

Production and development of non-conventional gas, Design for Hydro fracturing and cracking, well operation, production equipments, water disposal, Horizontal wells. Techniques associated with production and development

UNIT V: Gas hydrates 9

Gas hydrates – origin and occurrence. Drilling and completion of wells, gas extraction from gas hydrates. Environmental consideration of unconventional of oil and gas.Economics of development.

Total hours: 45

Course Outcome:

CO-1: Recognise and apply the concept of continuous accumulation system.

CO-2: Apply the concepts related to exploration and development of Shale Gas Reservoirs.

CO-3: Apply the concepts related to exploration and development of Coal Bed Methane.

CO-4: Understand and apply the concepts related to formation of gas hydrates.

CO-5: Understand and apply different conversion processes for the production of hydrocarbons.

CO-6: Demonstrate awareness related to environmental issues involved in the development of non-conventional hydrocarbon resources

CO-7: To understand environmental consequences of producing these reserves

TEXT BOOKS

1. Carrol John, "Natural gas hydrates: A guide for engineers",Gulf Publications, 4th edition, 2003.
2. SmithJ.M, " Chemical Engineering Kinetics", McGrawHill, 5th edition, 2002

REFERENCE BOOKS

1. Warner HR, "Emerging and Peripheral Technologies in Petroleum Engineering", volvi, 6th edition, 2007.
2. FoglerH.S., "Elements of Chemical Reaction Engineering", PrenticeHallofIndia, 3rd edition, 1998.
3. Farooai Ali Jones S A ,Ansmeldau RF, "Practical heavy oil recovery", 2nd edition, 1997.

15EPE060 Production Chemicals & oil field chemistry 3 0 0 3

Course Objectives: The objective of this course is for students to highlight the importance of chemistry in Oil field &well treatments. Oil, gas and water supply wells are damaged during their life time. Various types of damage can occur during drilling, completion and production.

UNIT-I Introduction **9**

Role of specialty of production chemicals- Functions, selection and types of drilling mud- Classifications and compositions of drilling mud- Dispersed non-inhibited systems- Chemicals: additives, thickener- Drilling fluid disposal, characterization of drilling fluids- Fluid loss additives- Clay stabilization: types and swelling impedes- Mechanisms causing instability, inhibitors of swelling- Chemicals in detail

UNIT-II Oilfield Metallurgy **9**

Dispersant: low molecular weight dispersant, synthetic, alternative and co-polymers- Natural modified polymers, dispersant for "S"- Reservoir: Bacteria control, mechanisms of growth, Detection of bacteria, mathematical model- Treatments with biocides, non biocide control- Various biocides- Bacterial corrosion- Water shutoff

UNIT- III Corrosion in the Oil Field **9**

Production :Corrosion inhibitors: classification and fields of application- Scale removal treatment , application techniques, amides- Nitrogen based- Poly amine derivatives- Imidazoline corrosion inhibitor, azoles- Carbonyl compounds- Scale inhibitors- Gelling agents

UNIT – IV Oil Field Chemicals

9

Oil spill- Chemicals in detail- EOR- Polymers- Chemicals in detail- Hydraulic fracturing fluids, Types and characterization- Oil based system- Foam based system, clay stabilization, fluid loss additives, drilling muds, bit lubricants, bacteria control, corrosion inhibitors, scale inhibitors, gelling agents.

UNIT- V Polymer Material **9**

Introduction Polymers and Additives for Cements Corrosion, Asset Integrity Management and Monitoring Standards and Testing. Nanomaterials and Nano-composites,Elastomers and Thermosets for downhole applications Pipes.

Total hours: 45

Course Outcome:

CO-1: Introduce students to the basic chemistry in the petroleum industry and in the production of petroleum products especially petrochemicals, as well as their usage as feedstock in for conversion plants and their end uses.

CO-2: Discuses the processes involved in the exploration of petroleum

CO-3: Detail information on the processes of treating petroleum and petroleum products.

CO-4: Summarize various petrochemicals; their production and uses

CO-5: Introduce the audience to origin of petroleum, the petroleum producing countries.

CO-6: Provide students with opportunities to understand and develop basic skills in designing and drawing conversion flow charts, development and incorporation of condition necessary in the chemical processes.

CO-7: Provide students with detailed information on Corrosion Inhibitors, Nano-materials and Nano-composites.

TEXT BOOKS

1. J.K. Borchardt and T.F.Yen,“Oil-Field Chemistry, Enhanced Recovery and Production Stimulation”, 1st edition, 1988
2. J. I. DiStasio,“Chemicals for Oil Field Operations”, 1st edition, 1981

REFERENCE BOOKS

1. L.J. Zitha,“Well Treatments and Water Shut-off by Polymer Gels”, 2000.
2. L.L. Schramm,“Surfactants Fundamentals and Applications in the Oil Industry”- 2000.

15EPE061 WellServices & Stimulation Techniques 3 0 0 3

Course Objectives: This course is designed to cover all aspects of well stimulation and its importance in increasing productivity of wells beside it discusses acidizing and fracturing quality control, conducting the treatment, monitoring pressures, and other critical parameters, during and after the treatment.

UNIT I: Introduction **9**

Introduction – importance of stimulation and work over techniques. Problems likely to be encountered – fishing, hole conditioning, sand encroachment, water and gas coning, pressure depletion, limited production rates, formation damage, wax deposition.

UNIT II: Well Problem Analysis **9**

Well problem analysis: Formation damage – selection of mud parameters, hole conditioning methods, bore hole environment, loss circulation, removal of mud cake, fishing – tools and methods.

UNIT III: Fracture - Stimulation **9**

Perforation job, squeeze cementing techniques, water and gas shut-off jobs, selection workover-planning rig selection criteria, workover fluids, circulation techniques, tubing retrievel, workover for low permeability well, partially pressure – depleted wells, reduction of water production, reduction of gas production in oil wells, zone transfers.

UNIT IV: Sand Production & Measurement **9**

Sand control – reasons for sand production, effects of sand production, control methods-gravel packing screen selection, gravel selection placement techniques.

UNIT V:Acidizing and Acid Fracturing **9**

Acidizing concept, types of acids and additives, Carbonate and elastic reservoirs. Hydraulic fracturing – designing of frac job, frac fluids, proppants and additions and their selection, post frac job evaluation.

Total hours: 45

Course Outcome:

CO-1: To learn, understand and be able to recall the main terminology, concepts, and techniques that applies to Well Completion and Stimulation.

CO-2: Apply a critical-thinking and problem-solving approach towards the design of a well completion.

CO-3: Apply theoretical and practice skills in real problems through case studies.

CO-4: Analyse, and devise relevant solutions to problems posed within the course, individually and with team mates.

CO-5: Interact with other students to practice teamwork and communication skills; providing a real well stimulation scenario.

CO-6: This course also covers the broad overviews of various completion techniques, tools, and wellhead types, and surface gathering systems.;

TEXT BOOKS

1. Earlougher, R.C., “Advances in Well Test Analysis”, Monograph Series, SPE,1977.
2. Michael J. Economides, Larry T. Watters, Shari – Donn“Petroleum Well Construction” –Norman-2001.

REFERENCE BOOKS

1. “Petroleum Production Engineering” – BoyunGuo, william C. Lyons & Ali GhalambasElseiver Science & Technology books.
2. ChaudhryAmanatU,“Oil Well Testing Handbook” Gulf ProfessionalPublishing, 2004, 699 pp.
3. Devereux, S., “Practical Well Planning and Drilling”, PennWell Corporation, 1998.

15EPE062 Field Development Plan 3 0 0 3

Course Objectives: To impart knowledge on the stages in the development of an oil/gas field, exploration study, data analysis, identification and development of oil field, the methods to be followed for sustained and optimal production, risk and economic factors to be analysed.

UNIT I: Production field **9**

Age of producing field - Stages of exploration delineation and development phases - Exploration stage – wild eat and exploratory wells. Resource and reserveestimation.Concepts and methods.

UNIT II: Analysis of exploration **9**

Analysis of exploratory results - Delineation of field - Exploratory step-out and step-in well test analysis - Reservoir performance - Review of maps and modifications, graphical methods for determining data

UNIT III: Data Analysis **9**

Development stage - Reservoir data analysis - Facies Changes of reservoirs data analysis.Facies changes of reservoirs and delineation of depositional environments - Seismic stratigraphyand reinterpretation. Well production and field performance.

UNIT IV: Field development **9**

Preparation of development plan - Reservoir characterisation - Compartmentalisation of reservoirs – faults. Identification - Identification of in-full wells–Recovery methods and identification.

UNIT V: Production **9**

Production logging, interpretation of time lapse seismic data, fluid movement identification, cluster and multilateral drilling, Risk analysis, break even economics, Finalization of plan, Abandonment of plans.

Total hours: 45

COURSE OUTCOMES:

CO-1: The students would understand the petroleum engineering aspects of planning, developing and operating oil and gas fields.

CO-2: At the end of the term, students should understand the process of planning and developing offshore oil and gas fields

CO-3: Students will be able to describe the most common offshore field architectures.

CO-4: The students will understand the depletion performance of a production system, the fundamentals of flow equilibrium calculations and the flow performance of networks.

CO-5: The students will be able to be self-critical and quality control their results, analyze them and perform sensitivity studies.

TEXT BOOKS

1. "Basics of Reservoir Engineering - Oil & Gas Field Development Techniques", Editions Technip, 1993
2. "Development and exploitation of oil and gas fields" Peace publishers, 1965

REFERENCE BOOKS

1. "Field Development Plan - Oil & Gas: Potential Impact of Reservoir Description and Development Options of Field", Lambert Academic Publishing, 2012.
2. BhagawanSahay - Petroleum Exploration and Exploitation Practices Miller,V.C., 1961, Photogeology., McGraw Hill, 4th edition, 2009.

15EPE063 AUTOCAD0 0 22

Course Objectives: To develop the students ability toprepare the industrial project report.These software tools will be beneficial in analyzing the raw technical data and draw conclusions accordingly. These software applications are practical oriented andindustry requirements expertise in this entirely depends on its practice.

Below are some basic features of these software tools.

AUTOCAD is a computer-aided design software program used extensively in all the engineering firms. AutoCAD allows the user to create 2D (two-dimensional) and 3D (three-dimensional) technical drawings using visualization and technical documentation. This software program increases productivity in manufacturing and design, replacing the need for manual drawings and designs. These days most of the engineering companies use AUTOCAD to ramp up productivity on design and manufacturing technologies. It is used to design and create accurate digital prototypes for a wide variety of oil and gas equipment as well.

Application in Petroleum Engineering: This design software will make students understand the workflow across all sections of the oil and gas industry. They can utilize this skill to enhance the industrial project report and provide higher quality documentation.

Conducting the course: The training in AUTOCAD software should include teaching classes, lab sessions along with user manual provided to the students. Once students are comfortable with 2D model features, the course can be upgraded to 3D version.

Total hours: 40

COURSE OUTCOME:

CO-1: Design students must be able to visualize and graphically reproduce complex layouts to succeed in subsequent drafting and design courses.

CO-2: Designers need to be able to communicate with each other, and with manufacturing and construction personnel using graphical representations of physical objects.

CO-3: AutoCAD design software is widely used in the Architectural Design and Drafting professions.

CO-4: Many Architectural Design and Drafting graduates enter the workplace by performing computerized graphics manipulations.

15EPE064 Major Project-Phase-I 0 0 2 0

Course Objectives: The student will choose any one Project in consultation with the Guide in their discipline.The student will carry out data collection, Literature studies and Mathematical Modelling calculations independently with the help of the guide. They have to complete the preliminary calculations and preliminary checks. Detailed design will be carried out in phase II of the project.

Total Hours: 40

COURSE OUTCOMES:

Projects can be one of the most efficient ways to learn as they force you to apply the skills while learning them. This, in fact, aids in retention and increases the usefulness of the skills learned:

According to research on "situated cognition," learning is maximized if the context for learning resembles the real-life context in which the to-be-learned material will be used; learning is minimized if the context in which learning occurs is dissimilar to the context in which the learning will be used

15EPE065 Petroleum Storage, Transportation & Marketing 3 0 0 3

Course Objectives: To impart the students with the various elements and stages involved in Transportation of oil and gas, storage and marketing. To understand the key techno-economic parameters of petroleum storage and transportation and sense real time scenario of global oil and gas trading.

UNIT: I Introduction **9**

Transportation of petroleum & petroleum products.Transportation modes. Storage methods. Basics of pipeline construction, operation and protection.Pump and compressor stations.Instrumentation and control.

UNIT: II Petroleum Storage **9**

Metering and measurements of oil and gas. Indian and Global supply scenario of petroleum and petroleum products. Product quality control. Storage of petroleum products in fixed installations. Standards and regulations.Types of storage tanks.Underground storage of natural gas.Bulk distribution and handling-domestic, commercial and industrial.

UNIT: III Oil Pricing & Control Mechanism **9**

Role of International oil companies and OPEC pricing mechanism. Administered andMarket determined pricing mechanism in India. Conservation of petroleum & its products, Spot and other market control mechanism. Indian and Global supply scenario of petroleum and petroleum products.

UNIT: IV Pricing **9**

Oil and Gas Prices: International Market and Geo politics, Crude oil characteristics, Marketing and trading of crude oil, Crude oil pricing, Mechanism and oil price elasticity.Issues in domestic petroleum pricing.

UNIT: V Pricing Economy strategy **9**

Inflation and effects on oil pricing.Factors controlling oil and gas pricing.Oil differential and influence on price of oil.Economics of long distance pipeline.Governments pricing policy for petroleum products.

Total hours: 45

COURSE OUTCOMES:

CO-1: List the components of each petroleum product

CO-2: Grasp the main characteristics of petroleum products and their relevance for end-users

CO-3: Identify recent changes and future trends.

- CO-4: This course provides a deeper knowledge of petroleum products' characteristics and understanding of their manufacturing scheme.

CO-5: Provide detail understating on oil differential and influence on price of oil

TEXT BOOKS

1. Oil & Natural Gas Transportation & Storage Infrastructure: Status, Trends, & Economic Benefits, report for American Petroleum Institute, IHS Global Inc, 2013.
2. Petroleum Storage Principles, PennWell Books,1983.
3. Harold Sill Bell,Petroleum Transportation Handbook, McGraw-Hill, 1963.
4. William Henry Day, Petroleum marketing practices and problems**,** Commercial Publishers, 1966

REFERENCE BOOKS

1. , The World Petroleum Market, The Johns Hopkins university press 1973.
2. Petroleum Marketing and Transportation**,** Dallas (Tex.) International Oil and Gas Educational Center, Gulf Publishing Company, 1964

15EPE066 Major Project-Phase-II 0 0 17 15

Course Objectives: The student will carry out the chosen project in this phase and he will submit the same for evaluation by the end of the semester. He will give a seminar presentation on the work carried out by him to the guide.

Total Hours: 40

COURSE OUTCOMES:

Projects can be one of the most efficient ways to learn as they force you to apply the skills while learning them. This, in fact, aids in retention and increases the usefulness of the skills learned:

According to research on “situated cognition,” learning is maximized if the context for learning resembles the real-life context in which the to-be-learned material will be used; learning is

minimized if the context in which learning occurs is dissimilar to the context in which the learning will be used

15EPE067 Project Presentation and viva voce 0 0 4 2

Course Objectives: The student will be presenting the project work that he has carried out to the external examiner, thereby he is examined.

Total Hours: 40

COURSE OUTCOMES:

CO-1: The individual presenter will carry out the terms of the presentation before the concerned guide

CO-2: Allows the individual presenter include his/her own methods and topics.

CO-3:Gives presenter the opportunity to bring out his or her particular talents and strengths

SYLLABUS

DISCIPLINE SPECIFIC ELECTIVES

15EPE101 **Petroleum Chemistry 3 0 0 3**

Course Objectives: This course is to provide students with an understanding of Petroleum Chemistry and the skills needed for successful employment. The course is primarily focused on the oil and gas sector of the petroleum industry. The skills include knowledge of chemical composition and properties of petroleum (oil and gas), petroleum products and alternative fuels.

UNIT I Introduction **9**

Composition of Petroleum– separation by molecular weight, type; Composition maps; Petroleum analysis and evaluation–ASTM evaluation, spectroscopic methods, thermal chemistry, hydro cracking.

UNIT II Composition of Petroleum **9**

Definitions, Petroleum formation, properties and general characteristics, composition, molecular types in petroleum, composition maps, Metals and hetero-atoms in heavy crude oil– heteroatom's concentrations, structure of Hetero-atom functions; Asphaltenes and structure of petroleum

UNIT III Thermal Chemistry of Petroleum Constituents **9**

Thermal chemistry of petroleum constituents – Introduction, historical development, Processes-visbreaking, visbreaking, coking, hydro-treating and hydro-cracking, process chemistry and physics

UNIT IV Hydro cracking **9**

Introduction, cracking processes, history, hydro-cracking, hydrogenation catalysts, strong acid cracking of hydrocarbons, solid, strong acid catalysts, poisoning aromatics, polynuclear aromatics, commercial hydrocracking

UNIT V Refinery processing **9**

Introduction to Refining Processes, Dewatering and Desalting, Early processes, distillation, thermal methods, catalytic methods, hydro processes, reforming, isomerization, polymerization processes, solvent processes, refining heavy feedstock's, petroleum products, petrochemicals

Total hours: 45

COURSE OUTCOMES:

CO-1: To understand petroleum composition and properties.

CO-2: To understand the composite maps and spectroscopic method.

CO-3: Give the processes involved in the exploration of petroleum.

CO-4: Give the processes of treating petroleum and petroleum products.

CO-5: Tell the various petrochemicals their production and uses.

CO-6: Introduce students to the basic chemistry in the petroleum industry and in the production of petroleum products especially petrochemicals, as well as their usage as feedstock in for conversion plants and their end uses.

CO-7: Provide students with opportunities to understand and develop basic skills in designing and drawing conversion flow charts, development and incorporation of condition necessary in the chemical processes

TEXT BOOKS

1. Speight, J.G., "Petroleum Chemistry and Refining", Taylor and Francis,London,1998
2. Tissot, B.P., Welte, D.H., "Petroleum Formation and Occurrence"-Wiley Publications-1984.

REFERENCE BOOKS

1. Hund J.M., "Petroleum Geochemistry and Geology", John Wiley Publishers-1996
2. Speight, J.G., "Chemistry and Technology of Petroleum", Marcel Dekker, New York, 1998

15EPE102 Advanced Offshore Engineering 3 0 0 3

Course Objectives: To enable the students to understand the basic concept of offshore drilling, types of offshore structures, techniques used in deepwater drilling, dynamic positioning of structures, types of riser systems and subsea systems

UNIT I Introduction **9**

Deviations from Onshore drilling, Challenges, Rig types: Jack-up, Semi-sub, Floaters. Deepwater Drilling: Introduction - History & Geology, Floating Drilling Rigs and chronological Advancements, Basic Floating Rig equipment, Rig Automation

UNIT II Dynamic Positioning **9**

Types and basic operations of a DP system, major components of the DP system , DP rig vs. moored rig , Types of thrusters used by DP vessels, Basic layout of a power distribution system onboard a DP vessel and associated protection systems, Power management system.

UNIT III Riser Systems **9**

Riser system Components, Buoyancy, Riser Tensioners & Tensioning Criteria, Basic Riser Analysis, Riser Operations, Emergency Disconnect, High Current Operations. Drill with mud – "pump and dump" concept

UNIT IV Subsea Wellheads **9**

Overview of Wellhead Components, Tool description, Wellhead sizing. BOP System: Wellhead & LMRP Connectors, RAM preventers, Annular Preventers, Choke & Kill line valves, LMRP, Landing & latching the BOP, Control System, Back-up system, BOP Stack Testing, Diverter System

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UNIT V Deepwater Casing & Cementation **9**

Review of conductor and surface casing design, Casing design process flow, Casing seat Selection, Kick Tolerance, Burst, Collapse, Tensile and bucking criteria & Calculations, Software assisted Casing Design, Casing running, Casing connections, Cementing Procedures , Casing and liner cementing; squeeze cementing, Cementation Hardware.

Total hours: 45

COURSE OUTCOMES:

CO-1: Provides knowledge needed to solve engineering problems related to both fixed and floating offshore structures.

CO-2: They will be able to use design codes to check the capacity of structural members.

CO-3: They will be proficient in the use of finite element software to perform computer simulations, thus being prepared for the practical needs of the industry.

CO-4: They will be able to calculate wave forces on fixed and floating structures and calculate the dynamic response

CO-5: The course will give an overview of standards and rules in subsea development and include practical challenges in flow assurance, subsea processing, well and drilling, marine operations the industry are facing today

CO-6: The course will also give a description of future trends in oil and gas field developments and an overview of what competences in mechanics the subsea industry needs to solve their complex challenges

CO-7: Evaluate and utilise appropriate technology for the implementation and extension of subsea developments and the continual operational improvement of installed subsea systems throughout their lifecycle

TEXT BOOKS

1. ”Advanced Offshore Engineering (Offshore Engineering Handbook)” 1994.
2. Subrata K. Chakrabarti , Handbook of Offshore Engineering, Volume 1 and 2, Elsevier,2001

REFERENCE BOOK

1. “Advanced Aspects of Offshore Engineering”, West European Graduate Education Marine Technology, Norwegian Institute of Technology, Jan 1979.

15EPE103 Reservoir Rocks & Fluids 3 0 0 3

Course Objectives: The objective of this course is to introduce students to basic reservoir rock and fluid properties. To impart knowledge about various types of rocks with emphasis on the properties and formation of reservoir rocks and the nature, characteristics and properties of fluids in the reservoir rocks.

Unit I: Introduction **9**

Composition and interior of the earth. Minerals and types of rocks – igneous, sedimentary and metamorphic rocks. Formation, structure and textures of igneous and metamorphic rocks. Plate tectonics.

Unit II: Sedimentary Rocks **9**

Sedimentary rocks: Formation and types. Sandstone, siltstone, shale, conglomerates. Carbonate rocks – limestone, dolomite. Structure & Texture of sedimentary rocks.

Unit III: Property of Rocks **9**

Properties of sedimentary rocks – colour, size, shape, porosity, permeability and their relationship. Electrical, resistivity and atomic properties. Effect of stress and strain, diagenesis, categenesis, metagenesis. Heterogenity – vertical and colour. Clay minerals and their formation and properties

Unit IV: Reservoir fluids **9**

Reservoir fluids – oil, gas and water and their relationship. Capillary pressure and its determination, fluid saturation, surface tension, pore size distribution. Wettability, evaluation and alternation of wettability and effect of fluids on rock properties.

Unit V: Fluid's Flow Property **9**

Flow types, flow regimes, Darcy's law, linear flow, Poiseville's law, flow system, multiple permeability. Fluid properties – Phase behaviour of hydrocarbon system. Fluid – rock interface and interaction. Fluid characteristics, PUT analysis. Flash liberation and differential liberation.

Total hours: 45

COURSE OUTCOMES:

CO-1: Recognize reservoir forming (sandstone and carbonate) rock types, their textures and pore structures

CO-2: Define porosity, discuss the factors which effect porosity, and describe the methods of determining values of porosity.

CO-3: Define the coefficient of isothermal compressibility of reservoir rock and describe methods for determining values of formation compressibility.

CO-4: Define the coefficient of isothermal compressibility of reservoir rock and describe methods for determining values of formation compressibility.

CO-5: Reproduce the Darcy equation in differential form, explain its meaning, integrate the equation for typical reservoir systems, discuss and calculate the effect of fractures and channels, and describe methods for determining values of absolute permeability.

TEXT BOOKS

1. F.J.Peltijohn, "Sedimentary rocks", 1st edition, 1998
2. Tarek Ahmed, "Reservoir Engineering Hand book", 3rd edition, 2001

REFERENCE BOOKS

1. Craft, B.C. and Hawkins, M.F, " Applied Petroleum Reservoir engineering", 4th edition, 2003.
2. Amyx. J.W, Bass D.M and whiting R.L "Petroleum Resrvoir Engineering", 1st edition, 1998.

15EPE104 Introduction to Marine Engineering 3 0 0 3

Course Objectives: To develop student's ability to understand ships machinery, lubrication systems, engine dynamics, steam turbines, etc. so that it is useful to the student during ship design and construction. This course is to explain the operation of the ship's machinery to the junior Engineer or Engineer Cadet who is embarking on a career at sea.

UNIT I Machinery selection for ships 9

Ships and machinery - design and selection considerations; Marine diesel engines general engine principles, Low speed and medium speed diesel engines, Constructional features. Fuels, Fuel oil system-Scavenging and turbo charging. Starting and reversing systems, controls and safety devices, governing; Lubrication, Lubricants and lub-oil systems, cooling systems-torque and power measurement, fuel consumption's characteristics, engine lead tests and general characteristics-Heat balance, waste heat recovery system.

UNIT II Boilers and Pumps 9

Marine boilers types, fire tube and water tube boilers, boiler arrangements-steam to steam boilers, double evaporation boilers, exhaust gas heat exchangers, auxiliary steam plant systems, exhaust gas boilers, composite boilers. Boiler mounting, combustion, feed system, feed water treatment, Feed pumps, condensers, air rejecters, deaerators, boiler operation, coal fired boilers.

UNIT III Marine turbines and propulsion system 9

Marine Steam turbines - Types of turbines, compounding - reheat turbines, turbine construction, rotors, blades, casing, Gland sealing, diaphragms, nozzles, bearings, etc. Lubrication systems, expansion arrangements, control, gearing operating procedure. Marine gas turbines - fundamentals of G.T., Structure of gas turbines, gearing, operational features, controls, gearing, combined cycles. Nuclear propulsion - physical principles of the operation of nuclear reactors – use of nuclear propulsion on seagoing vessels.Automation of ship, propulsion plants.Maintenance requirements and reliability of propulsion plants.

UNIT IV Air conditioning and Refrigeration 9

Air Conditioning and Refrigeration.Definition and purpose.Psychometric - psychometric properties of air-Psychometric chart – Adiabatic saturation.Psychrometric process. Sensible heating and cooling, Humidification and dehumidification, cooling and humidification, Cooling and dehumidification-heating and humidification, Heating and dehumidification, adiabatic mixing of air streams-cooling and heating load calculation, Summer and winter air conditioning - Estimation of the state of supply air to theairconditioned space- Quantity of air supply etc. for simple winter air conditioning systems.

UNIT V Pumpsonboard ships 9

Marine and special duty pumps, Marine piping, valves, types used in Marine Practice. Materials and corrosion in pipes.colour codes for pipes.Auxiliary systems, boilers, heat exchangers, evaporators, distillers, drinking water, cooling water, Fuel systems, lubricating oil system-filters, coolers; centrifuges and clariters.Bilge and Ballast systems. Deck machinery: Deck machine and hull equipment. Steering gear system: Steering gears in marine use. Safety systemsfirefightingequipment,Instrumentation& Control, watch keeping system.

Refrigeration: Definition and purpose, Principle of operation of Simple vapour compression system. Fire fighting equipment, Principle of operation of Simple vapour compression system.

Total hours: 45

COURSE OUTCOMES:
On completion of these courses, the student will be able to be familiar with

CO-1: Machinery selection for ships
CO-2: Marine Engines and Engine dynamics
CO-3: Boilers
CO-4: Marine turbines
CO-5: Propulsion system

TEXT BOOKS

1. H. D. Mcgeorge, "General Engineering Knowledge", 3rd edition, 2008.
2. Pounder C.C;" Marine Diesel Engines", Newnen - Butterworths, London.
3. Reed's "Marine Engineering for Naval Architect"-2002

REFERENCE BOOKS

1. Harrington, "Marine Engineering", SNAME Publications, 4th edition, 2010.
2. Taylor, D.A,"Introduction to Marine Engineering", Butterworth-Heinemann, 2nd edition, 2003.
3. J. Crawford, "Marine offshore pumping and piping systems", 5th edition, 2001.

15EPE105 Elements of Reservoir Engineering 3 0 0 3

Course Objectives: To impart knowledge to the students on the basic concept of reservoir engineering, characteristics of crude oil and gas, rock properties, characteristics of reservoir fluids, flow through porous media and various measurements and measuring systems.

UNIT I Introduction **9**

Introduction to reservoir engineering,characteristics of crude oil and natural gas, classification of crude and its physicochemical properties, calculation of hydrocarbon volumes, fluid pressure regimes, volumetric gas reservoir engineering.

UNIT II Reservoir Rock Properties **9**

Porosity and permeability determination, combination of permeability in parallel & series beds, porosity permeability relationship, fluid saturation determination and significance, effective and relative permeability, wettability, capillary pressure characteristics, measurements and uses. Coring and Core Analysis

UNIT III Reservoir Fluids **9**

Phase behavior of hydrocarbon system, ideal & non ideal system, equilibrium
ratios, reservoir fluid sampling, PVT properties determination, different correlations and laboratory measurements, data reduction, evaluation and application.

UNIT IV Flow of Fluids through Porous Media **9**

Darcy's law, single and multiphase flow, linear, radial & spherical flow, steady state & unsteady state flow, GOR, WOR equations, derivation of the basic radial flow equation, condition of solution.

UNIT V Measuring system **9**

Reservoir Pressure Measurements and Significance- Techniques of pressure measurement. Reservoir Drives: Reservoir drive mechanics and recovery factors. Reserve estimation: resource & reserve concept.

Total hours: 45

COURSE OUTCOMES:

CO-1: To know and recognize the main terminology, concepts, and techniques that applies to reservoir engineering founded on a theory based understanding of mathematics and the natural and physical sciences

CO-2: Suggest approaches and strategies for the assessment and quantification of reservoir uncertainty and data management validated against national or international standards

CO-3: Apply a critical-thinking and problem-solving approach towards the main principles of reservoir engineering demonstrated through appropriate and relevant assessment

CO-4: Apply theoretical and practice skills in data analysis used for real problems through case studies based on empirical evidence and the scientific approach to knowledge development

CO-5: Analyse, and devise relevant solutions to problems posed within the course, individually and with team mates

TEXT BOOKS

1. Tarekahmed ,"Reservoir engineering hand book", 3rd edition, Gulf publishing house, 2006.
2. Guo, B,Lyons, W.C. and Ghalambor, A., Petroleum production engineering: a computer assisted approach, Gulf Professional Publishing, Burlington, 3rd edition, 2006.

REFERENCE BOOKS

1. Tarek Ahmed, Paul D Mc Kinney, "Advanced reservoir engineering" Gulf publishing house, 2nd edition, 2005.
2. AbdusSatar, James L Butchwater, "Practical enhanced reservoir engineering" Penwell corporation, 2nd edition, 2007.

15EPE106 Process Instrumentation Dynamics and Control 3 0 0 3

Course Objectives:

To introduce control equipments used to control the production process of a chemical Factory and to introduce the control mechanism through automation and computers.Gains knowledge in designing a control system and identifying the alternative control configuration for a given process plant or entire plant. He will be familiar with the control mechanism before attempting to tackle process control problems.

UNITIIntroduction **9**

Laplace transformation, transform of standard functions, derivatives and integrals, inversion, theorems in Laplace transformation, application .Open-loop systems, first order systems and their transient response for standard input functions, first order systems in series, linearization and its application in process control, second order systems and their dynamics, transfer function for chemical reactors and dynamics.

9

UNITII Closed loopsystem

Closed loop control systems, development ofblock diagram for feed-back control systems, servo and regulator problems, Transfer function for controllers and final control element, principles of pneumatic and electronic controllers, transportation lag, transient response of closed-loop control systems and their stability.

9

UNITIII Open loop system

Introduction to frequency response of closed-loop systems, open loop control system, control system design by frequency, Bode diagram, stability criterion, Nyquist-diagram; Tuning of controller settings.

9

UNITIV Advanced control system

Controller mechanism ,introduction to advanced control systems, cascade control, feed forward control, control of distillation towers and heat exchangers, introduction to microprocessors and computer control of chemical processes.

9

UNITV Measurements & Instruments

Principles of measurements and classification of process control instruments, measurements of temperature, pressure, fluid flow, liquid weight and weight flow rate, viscosity and consistency, pH, concentration, electrical and thermal conductivity, humidity of gases, composition by physical and chemical properties and spectroscopy.

Total hours: 45

COURSE OUTCOMES:

CO-1: Understand the basic principles & importance of process control in industrial process plants.

CO-2: Specify the required instrumentation and final elements to ensure that well-tuned control is achieved.

CO-3: Understand the use of block diagrams & the mathematical basis for the design of control systems.

CO-4: Design and tune process (PID) controllers.

CO-5: Use appropriate software tools (e.g. Matlab Control Toolbox & Simulink) for the modelling of plant dynamics and the design of well tuned control loops.

CO-6: Understand the importance and application of good instrumentation for the efficient design of process control loops for process engineering plants.

CO-7: Draw a PID (Process & Instrumentation Diagram) & devise simple but effective plant wide control strategies using appropriate heuristics.

TEXTBOOKS

1. CoughnowrandKoppel,"ProcessSystemsAnalysisandControl",McGraw-Hill,New York,1986.
2. George Stephanopolous, "Chemical Process Control", Prentice-Hall of India Pvt. Ltd.,NewDelhi,1990.
3. Patranabis.D, Principlesof Process control, II edition, Tata McGraw-Hill Publishing Co.Ltd.,1981.
4. Peter Harriott, Processcontrol, Tata McGraw-Hill Publishing Co., Reprint 2004.

REFERENCE BOOKS

1 Thomas, E.Marlin, Process Control, 2nd Edn, McGraw-HillsInternational Edn. 2000.
2 GeorgeStephanopoulos, Chemical Process Control, PrenticeHallofIndia 2003.
3 Norman H.Ceaglske, Automaticprocesscontrol for chemical engineers, John
4 Wiley&Sons, Japan.
5 Emenule, S.Savas, "Computer Control ofIndustrial Processes", McGraw-Hill, London, 1965.
6 Eckman, D.P., "IndustrialInstrumentation", Wiley, 1978.

15EPE107 Multi-component Distillation 3 0 0 3

Course Objectives: To enable the students to understand the basic principles of thermodynamics, thermodynamic property of multi-component mixtures, minimum reflex ratio of MCD systems, properties and Methods of MCD column design

UNIT I Thermodynamic Principles 9

Fundamental Thermodynamic principles involved in the calculation of vapour– liquid - Equilibriaand enthalpies of multi-component mixtures– Use of multiple equation of state for the calculation of K values– Estimation of the fugacity coefficients for the vapour phase of polar gas mixtures– calculation of liquid– phase activity coefficients.

UNIT II Thermodynamic Property Evaluation 9

Fundamental principles involved in the separation of multi component mixtures– Determination of bubble-point and Dew Point Temperatures for multi-component mixtures– equilibrium flash distillation calculations for multi-component mixtures– separation of multi component mixtures at total reflux.

UNIT III Minimum reflux ratio for MCD System **9**

General considerations in the design of columns– Column sequencing– Heuristics for column sequencing– Key components– Distributed components– Non-Distributed components – Adjacent keys. Definition of minimum reflux ratio – calculation of Rmfor multi-component distillation– Underwood method– Colburn method.

UNIT IV Various Methods of MCD Column Design **9**

Theta method of convergence – Kb method and the constant composition method– Application of the Theta method to complex columns and to system of columns–Lewis Matheson method– Stage and reflux requirements– Short cut methods and Simplified graphical procedures.

UNIT V Various Types of MCD Columns **9**

Design of sieve, bubble cap, valve tray sand structured packing columns for multi-component distillation– computation of plate efficiencies, principle type of reactors, screening, mixing.

Total hours: 45

COURSE OUTCOMES:

CO-1: Determination of operating pressure for the various industrial distillation columns, criteria for vacuum distillation, PROS & CONS of vacuum distillation

CO-2: Short cut methods: Fenskey-Underwood-Gilliland's method, Rigorous methods: Lewis-Metheson method, Theile-Geddes method,Equation tearing procedures using tridiagonal matrix algorithum

CO-3: Concept and working principle, industrial examples, determination of number of theoretical stages for azeotropic and extractive distillation, advantage and disadvantage over each other.

CO-4: Design of multicomponent batch distillation with and without rectification.

CO-5: By heat integration, advanced process control, thermally coupled distillation column, use of heat pumps.

TEXT BOOKS

1. Holland, C.D., "Fundamentals of MultiComponent Distillation", McGraw Hill Book Company,1981
2. Van Winkle, "Distillation Operations",McGrawHill Publications, 1987.

REFERENCE BOOKS

1. S.B.Thakore&B.I.Bhatt, "Introduction to process engineering and design", Tata McGraw-Hill, 2007.
2. P.B.Despande, " Distillation dynamics and control", Arnold USA 1985

15EPE108 Surveying 3 0 0 3

Course Objectives: To impart knowledge to the students on the importance of surveying, classification, principles of surveying, linear and angular measurement techniques, various types of instruments used for surveying and the panel table survey method.

UNIT I Introduction to Surveying **9**

Objective of surveying and its importance, Classification, principles of surveying, Application of Surveying in various fields of Engineering, trigonometric levelling, determination of coefficient of refraction.

UNIT II Linear measurements **9**

Conventional Instruments for measuring distances, ranging and chaining out of survey lines, Obstacle in chaining and errors in chaining, corrections-Principles, offsets, booking field notes, problems. Linear measurements (EDMs): Theory and characteristics of electromagnetic waves, radio waves, infra red, laser waves, principle of distance measurement with EDMs.

UNIT III Angular measurements **9**

Principle and constriction of prismatic compass, bearing of lines, local attraction, magnetic declination and examples. The odolite: The essentials of transit the odolite, definition and terms, temporary adjustments, measurement of horizontal and vertical angles, different operations and sources of error, the odolite traversing, Omited Measurements.

UNIT IV Levelling instruments **9**

Definition, different type of levelling instruments, curvatures and refraction corrections, reciprocal levelling, errors in levelling and problem solving, axial signal correction, difference of elevation

UNIT V Plane Table Surveying **9**

General, Methods, Intersection, Traversing, Resection, two point problem and three points problem etc. Contouring:General, Contour Interval, Characteristics, Methods of locating contours, Interpolation etc.

Total hours: 45

COURSE OUTCOMES:

CO-1: Appreciate the need for accurate and thorough note taking in field work to serve as a legal record.

CO-2: Gain the ability to use modern survey equipment to measure angles and distances

CO-3: Gain an appreciation of the need for lifelong learning through the discussion of recent changes in survey procedures and equipment.

CO-4: Have the ability to use techniques, skills, and modern engineering tools necessary for engineering practice

CO-5: Gain the ability to measure differences in elevation, draw and utilize contour plots.

TEXT BOOKS

1. Manual of Offshore Surveying for Geoscientists and Engineers" Springer, 1997
2. Paul R Pinet, Invitation to oceanography, 6th edition, Content technologies

REFERENCE BOOKS

1. W.Schofield, "Engineering Survey", 5th edition, Elsevier-2001.
2. B. C. Punima, "Surveying", Firewall media, volume 1, 6th edition, 2005.

15EPE109 Reservoir Fluid Thermodynamics 3 0 0 3

Course Objectives: To impart knowledge to the students on the work calculation of ideal and non ideal gases, horse power, thermodynamics of gases and liquid hydrocarbons, phase rule of single, two, three multi-component and multi-phase systems.

UNIT I Work Calculations **9**

Work calculation for compression/ expansion of ideal and non ideal gases, compression cycles and horse power calculations - single, double and multistage with and without clearance.

UNIT II Thermodynamics of Gases and Liquid Hydrocarbons **9**

Free energy & work function, Mollier diagrams, perfect & imperfect gaseous mixtures, Equation of state, Law of corresponding states, Joule Thompson effect, Arrhineous equation and activation energy. Fugacity and fugacity coefficient of gases and gaseous mixtures, Lewis fugacity rules and Third law of thermodynamics.

UNIT III Solution Thermodynamics **9**

Vapour liquid equilibria, equilibrium constant, partial molar properties, chemical potential, Raoult's law and Henry's law, ideal and non ideal solutions, Activity and activity coefficients, Gibb's Duhem equation, Gibb's adsorption equation.

UNIT IV Phase Rule **9**

Phase rule of single, two, three, multi-component and multi phase systems, phase behaviour indifferent conditions, Thermodynamic aspects of phase equilibria. Calculation of phase equilibria, Ternary and pseudo ternary phase diagrams

UNIT V Fluid Flow Thermodynamics **9**

Single phase flow & multiphase flow through vertical, incline and horizontal conduits. Pressure traverse curves and their applications.Venturi flow, nozzle flow, pipe internal flow, annular flow and nozzle flow thermodynamics of multiphase &multi-component system.

Total hours: 45

COURSE OUTCOMES:

CO-1: To clearly explain the differences between engineering and petroleum thermodynamics.

CO-2: To understand the PVT properties and heat transfer in reservoirs.

CO-3: To have a fundamental awareness on the petroleum chemical thermodynamics.

CO-4: To understand the entropy, enthalpy potential in petroleum reservoirs.

CO-5: To be well versed with qualitative phase behavior of petroleum systems.

CO-6: To be aware of Gibbs phase rule, thermodynamic equilibrium, and hydrates formation.

CO-7: To characterize different petroleum fluids by using the principles of applied thermodynamics.

CO-8: To be well versed with the concepts of gas and oil formation volume factors.

CO-9: To understand and evaluate the properties of mixtures.

CO-10: To determine the fuels calorific value and vapor mixtures.

TEXT BOOKS

1 "Phase Behavior of Petroleum Reservoir Fluids" 2nd edition, CRC Press, 1998.

2. Abbas Firoozabadi, "Thermodynamics of Hydrocarbon Reservoirs"1st Edition, McGrawHill , 1999.

REFERENCE BOOKS

1. Ali Danesh, "PVT and Phase Behaviour Of Petroleum Reservoir Fluids", Elsevier, 1998
2. J. Hagoort, "Fundamentals of Gas Reservoir Engineering", Elsevier, 1988

15EPE110 Petroleum Storage, Transportation & Marketing 3 0 0 3

Course Objectives: To impart the students with the various elements and stages involved in Transportation of oil and gas, storage and marketing. To understand the key techno-economic parameters of petroleum storage and transportation and sense real time scenario of global oil and gas trading.

UNIT: I Introduction 9

Transportation of petroleum & petroleum products.Basics of pipeline construction, operation and protection.Pump and compressor stations.Storage of petroleum products, Instrumentation and control.

UNIT: II Petroleum Storage 9

Metering and measurements of oil and gas. Indian and Global supply scenario of petroleum and petroleum products. Product quality control. Storage of petroleum products in fixed installations. Standards and regulations.Types of storage tanks.Underground storage of natural gas.Bulk distribution and handling-domestic, commercial and industrial.

UNIT: III Oil Pricing & Control Mechanism **9**

Role of International oil companies and OPEC pricing mechanism. Administered andMarket determined pricing mechanism in India. Conservation of petroleum & its products, Spot and other market control mechanism. Indian and Global supply scenario of petroleum and petroleum products.

UNIT: IV Pricing **9**

Oil and Gas Prices: International Market and Geo politics, Crude oil characteristics, Marketing and trading of crude oil, Crude oil pricing, Mechanism and oil price elasticity.Pricing strategies for selling a product or service.

UNIT: V Pricing Economy strategy **9**

Inflation and effects on oil pricing.Factors controlling oil and gas pricing. Oil differential and influence on price of oil.Economics of long distance pipeline. Premium pricing, penetration pricing, price skimming.

Total hours: 45

COURSE OUTCOMES:

CO-1: This course provides a deeper knowledge of petroleum products' characteristics and understands their manufacturing scheme.

CO-2: Upon completion of the course, the participants will be able to list the components of each petroleum product.

CO-3: Identify recent changes and future trends.

CO-4: Understanding Inflation and effects on oil pricing.

CO-5: Students will be able to understand efficiently metering and measurements of oil and gas.

TEXT BOOKS:

1. Oil & Natural Gas Transportation & Storage Infrastructure: Status, Trends, & Economic Benefits, report for American Petroleum Institute, IHS Global Inc, 2013.
2. Petroleum Storage Principles, PennWell Books,1983.
3. Harold Sill Bell, Petroleum Transportation Handbook, McGraw-Hill, 1963.
4. William Henry Day, Petroleum marketing practices and problems, Commercial Publishers, 1966.

REFERENCE BOOKS:

1. The World Petroleum Market, The Johns Hopkins university press 1973.
2. Petroleum Marketing and Transportation, Dallas (Tex.) International Oil and Gas Educational Center, Gulf Publishing Company, 1964

SYLLABUS

GENERIC ELECTIVES

15EPE151 Statistics and Linear Programming 3 0 0 2

Course Objectives: This course presents the theory, application and algorithms relevant to solving linear programming problems. Also includes the simplex method for linear programming, duality and sensitivity analysis. To understand the basic theory behind LP, algorithms to solve LPs, and the basics of (mixed) integer programs (ILP).

Unit I Testing of Hypothesis **9**

Samplingdistributions- Tests forsinglemean , proportion and differenceof means (large and smallsamples)– Tests forsingle variance andequalityof variances– Chi-Square test for goodness of fit–Independenceofattributes– Non-parametric tests: Test for Randomness and Rank-sum test(Wilcoxon test).

Unit II Design ofexperiments **9**

Randomization and Design - Randomization against Confounding- Randomization for Inference- Structure of Completely Randomized Designs- Preliminary Exploratory Analysis-Models and Parameters- Estimating Parameters.

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Unit III Statistical Quality Control **9**

categories of statistical quality control (SQC)- Acceptance Sampling- Control charts for measurements (Xchartsand R charts)– Control charts for attributes(p charts, C charts andNp-charts)– Tolerancelimits-Acceptancesampling.

Unit IV Linear programming **9**

The Standard Maximum and Minimum Problems-Dual Linear Programming Problems-Formulation – Graphicalsolution– Simplex method– Big-M method-TransportationandAssignment models, fundamental theorem of linear programming,

Unit V Advanced Linear Programming **9**

Introduction about large L.P. problems, Graphical solution- Geometric interpretation-Duality– Dual simplex method–Integer programming –Cutting-planemethod.- the primal-dual algorithm, and Wolfe-Dantzig decomposition.

Total hours: 45

COURSE OUTCOMES:
Upon successful completion of this course, the students will be able to:

CO-1: Use computational techniques and algebraic skills essential for success in an academic, personal, or workplace setting.

CO-2: Use visualization, special reasoning, as well as geometric properties and strategies to model and solve problems.

CO-3: Collect, organize, and display data as well as use appropriate statistical methods to analyze data and make inferences and predictions.

CO-4: Critically analyze and construct mathematical arguments.

CO-5: Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions.

TEXT BOOKS

1. Johnson, R.A. and Gupta, C.B., Miller andFreunds"Probabilityand Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007).
2. TahaH.A.,"OperationsResearch", Pearson Education, Asia, 8th edition, (2007).

REFERENCE BOOKS

1. Walpole, R.E., Myers, R.H., Myers, S.L.andYe,K., "Probabilityand Statistics for Engineers and Scientists",PearsonEducation, Asia, 8th edition, (2007).
2. Devore, J.L.,"Probabilityand Statistics forEngineeringand the Sciences",Thomson Brooks/Cole,InternationalStudent Edition, 7th edition, (2008).
3. Winston,W.L.,"OperationsResearch–Applications and Algorithms", Thomson, 1st Indian Reprint, 4th edition, (2007).

15EPE152 Equilibrium Staged Operations 3 0 0 2

Course Objectives: To impart knowledge on the design of different staged operations using the concept of equilibrium. The students will learn in detail the unifying theory and design of different staged operations like absorption, distillation, extraction and adsorption.

Unit I -Absorption **9**

Gas Absorption and Stripping– Equilibrium; material balance; limiting gas-liquid ratio; tray tower absorber –calculation of number of theoretical stages, tray efficiency, tower diameter; packed tower absorber –rate based approach; determination of height of packing using HTU and NTU calculations.

Unit II-Distillation **9**

Vapour liquid equilibria – Raoults law, vapour– liquid equilibrium diagrams for ideal and non-ideal systems, enthalpy concentration diagrams. Principle of distillation – flash distillation, differential distillation, steam distillation, multistage continuous rectification, Number of ideal stages by Mc.Cabe- Thiele method and Ponchan- Savarit method, Total reflux, minimumrefluxratio,optimumrefluxratio.Desingofazeotropicandextractivedistillation columns.

Unit III- Multicomponent Distillation **9**

Fundamental principles involved in the separation of multi component mixtures – equilibrium flash distillation calculations for multi component mixtures – separation of multi component mixtures attotal reflux. Calculation of minimum reflux ratio. Determination of number of trays

Unit IV- Liquid Extraction **9**

Liquid- liquid extraction- solvent characteristics– equilibrium stage wise contact calculations for batch and continuous extractors- differential contact equipment spray, packed mechanicallyagitatedcontactorsandtheirdesigncalculations-packedbedextractionwith reflux. Pulsed extractors, centrifugal extractors-Supercritical extraction

Unit V-Adsorption &Membrane separation Process **9**

Adsorption-Types of adsorption, nature of adsorbents , adsorption equilibria, effect of pressure and temperature on adsorption isotherms, Adsorption operations – stage wise operations, steady state moving bed and unsteady state fixed bed adsorbers, breakthrough curves. Solid and liquid dmembranes; concept of osmosis; reverse osmosis; electrodialysis; ultrafiltration.

Total hours: 45

COURSE OUTCOMES:

CO-1: Diffusional separation processes in staged and continuous contact equipment, including distillation, absorption and liquid-liquid extraction.

CO-2: Be able to calculate the emissivity and absorptivity of particulate clouds of soot or coal based on certain simplifying assumptions.

CO-3: Be able to estimate the emissivity of mixture of gas and particles.

CO-4: Be able to calculate the heat transfer from a radiating well-stirred volume of gas and particles to the walls of an enclosure of arbitrary shape.

CO-5: To critically appraise the data and interpret it in light of their understanding of reaction engineering.

TEXT BOOKS

1. Wankat, P.,"EquilibriumStageSeparations", PrenticeHall.
2. Treybal, R.E.,"MassTransfer Operations ", 3rdEdn., McGraw-Hill.
3. Seader, J.D. and E.J. Henley, “Separation ProcessPrinciples”, 2nd Ed., John Wiley,2006.

REFERENCE BOOKS

1. W.LMcCabeJ.C.Smith,and Harriot. P., "Unit Operations of Chemical Engineering", sixthedition McGraw-Hill.International Edition, 2001.
2. C.Judson King"SeparationProcesses", Tata McGraw-Hill1974.
3. R.F.Strigle(jr), Packed Tower Designand Application, 2nd edition, Gulf Publishing company.

15EPE153 Marine Electrical Technology 3 0 0 2

Course Objectives: To develop student’s ability to understand electrical motors, starters, switch boards, electrical installations and safety on board the ship. To study about miscellaneous marine equipment and alarm system, Maintenance of electrical equipment, Single phase and three phase measurements.

UNIT I AC Motors and Starters **9**

Understand the Principle of operation of a direct on line starter (DOL) starter,Star delta starter, autotransformer starter, Understand the need and means for motor protection.
AC Motors**,** Understand the construction and characteristics of a squirrel cage induction motor Understand the principle of operation of a single phase motor

UNIT II AC Generator **9**

Understand the construction and principle of operation of a three phase ac generator, ac regulation on ac generator, ac generator active and reactive load sharing, generator synchronizing procedure (SIMULATOR).

UNIT III Switch Board **9**

Understand the function of the main switchboard, need and methods ac system protection. Neutral system understands the types of neutral systems and earth fault. Emergency supplies the operation and maintenance of commonly used batteries on board ship the operation of the emergency generator. Insulation resistance understand insulation resistance measurement.

UNIT IV DC Generator **9**

Understand the construction and principle of operation of a dc generator DC motor,understand the construction and operation of dc motor ship lightning Understand different types of lightings installed onboard ships. 3 phase ac system Understand principle of 3 phase alternating voltage generation.

UNIT V Electrical Installations and Safety **9**

Understand hazards of live electrical systems and safe electrical practice. Fuse protection, general maintenance.Instrumentationtemperature, Pressure, Torque, Rpm measuring devices – methods working Principles.

Total hours: 45

COURSE OUTCOMES:

On completion of these courses, the student will be able to be familiar with

CO-1: Electrical motors
CO-2: Starters
CO-3: Switch boards
CO-4: Electrical installations and safety devices
CO-5: AC generators and DC generators
CO-6: Electrical equipment provided on board the ship

TEXT BOOKS

1. Elstan.A. Fernandez., “Marine Electrical Technology”, 1st Edition, “Sterling Book House”,Mumbai, 2002.
2. BOWIC C.T., “Marine Electrical Practice”, 5th Edition, “Butter Worth”, London, 1981.

REFERENCE BOOKS

1. LAW S.W., “Electricity Applied to Marine Engineering”, 4th Edition, “The Institute of Marine Engineers”, London, 1998.
2. “Electrical Measurement and Measuring Instruments” by SuryanarayanaStriling Book House.

15EPE154 Energy Technology 3 0 0 2

Course Objectives: This Course provides an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. The class will explore society’s present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro.

Unit I Energy **9**

Units of energy,conversion factors,general classification of energy, worldenergyresources and energyconsumption,Indianenergyresourcesand energyconsumption, energycrisis,

energyalternatives, Renewable and non-renewable energysourcesand their availability. Prospects of Renewableenergysources

Unit II Conventional Energy **9**

Conventional energyresources, Thermal, tydeland nuclearreactors, thermal, hydeland nuclear power plants, efficiency, merits anddemerits of the abovepower plants, combustion processes,fluidized bed combustion.

Unit III Non-Conventional Energy **9**

Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solardistillation, solar refrigeration, solar dryers, solar pond, solar thermal powergeneration, solar energyapplication inIndia,energyplantations. Wind energy, types ofwind-mills, typesof wind rotors, Darrieusrotor and Gravianrotor,windelectric powergeneration,wind power inIndia,economicsof wind farm, oceanwave energy conversion, ocean thermalenergy conversion, tidal energyconversion,geothermal energy.

Unit IV BiomassEnergy **9**

Biomass energyresources, thermo-chemical and biochemical methods of biomass conversion,combustion, gasification, pyrolysis, biogas production, ethanol,fuel cells, alkaline fuel cell, phosphoricacidfuel-cell, moltencarbonate fuel cell, solid oxide fuel cell, solid polymerelectrolytefuel-cell, magneto hydrodynamicpowergeneration, energystorageroutes likethermal energystorage,chemical, mechanicalstorage andelectrical storage.

Unit V Energy Conservation **9**

Energyconservation in chemical process plants, energyaudit, energysavingin heat exchangers, distillation columns, dryers, ovens and furnaces andboilers, steam economyin chemical plants, energyconservation.

Total hours: 45

COURSE OUTCOMES:

CO-1: Ability to make material balances on unit operations and processes

CO-2: Ability to perform simultaneous material and energy balances

CO-3: Understanding of the degrees of freedom analysis and its significance

CO-4: Understanding of the concept of humidity and usage of psychrometric chart

CO-5: Knowledge of solid, liquid and gaseous fuels

TEXT BOOKS

1. Rao, S. and Parulekar,B.B., “EnergyTechnology”,KhannaPublishers, 2005.
2. Rai, G.D.,“Non-conventional EnergySources”,KhannaPublishers, NewDelhi, 1984.
3. Bansal, N.K., Kleeman, M. and Meliss, M.,“Renewable EnergySourcesand Conversion Technology”, Tata McGraw Hill, 1990.
4. Nagpal, G.R.,“PowerPlant Engineering”, KhannaPublishers, 2008.

REFERENCE BOOKS

1. NejatVezirog, “Alternate EnergySources”,IT, McGraw Hill, New York.
2. El. Wakil, “Power PlantTechnology”, Tata McGraw Hill, New York, 2002.
3. Sukhatme. S.P., “SolarEnergy-Thermal Collection and Storage”, TataMcGraw hill, NewDelhi, 1981.

15EPE155 Professional Ethics 3 0 0 2

Course Objectives: To impart and create an awarenessamong students on Engineering Ethics and Human Values. To understand social responsibility of an Engineer .To appreciate ethical dilemma while discharging duties in professional life.

UNIT I Human Values **9**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II Engineering Ethics **9**

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT IIIEngineering as Social Experimentation **9**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, similarities and contrast of engineering with standard experiments.

UNIT IVEngineer’s Responsibility for Safety **9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and Chernobyl case studies. 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 - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

Total hours: 45

COURSE OUTCOMES:

CO-1: The students will understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.

CO-2: The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field

CO-3: The students will be aware of responsibilities of an engineer for safety and risk benefit analysis.

CO-4: The students will be aware of professional rights and responsibilities of an engineer.

CO-5: The students will acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “ Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. 4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

15EPE156 SupplyChainManagement 3 0 0 2

Course Objectives: To understand the various decision phases in a supply chain, to be aware of the Supply Chain and its drivers, to design Supply Chain Network, to build a aggregate plan in supply chain, to understand Sourcing Decisions in Supply Chain to comprehend the influence of Information technology in Supply Chain

UNIT I Introduction to Supply Chain **9**

Understanding Supply Chain- The Development Chain - Decision phases - Supply chain performance -Competitive and supply chain strategies - Key issues in Supply Chain Management Achieving strategic fit – Expanding Strategic scope

UNIT II Supply Chain Drivers and Design **9**

Drivers of supply chain performance – Designing distribution network – Network Design in the Supply Chain - Network design in Uncertain Environment-Implementing a competitive approach to Warehousing and Distribution

UNIT III Aggregate Planning andManaging Supply, Demand and Inventory **9**

Aggregate Planning in a Supply chain: role - Managing Supply – Managing Demand in Supply Chain – Cycle and Safety inventory in supply chain – Methodology of Supply Chain Management project-solutions-Level of product availability.

UNIT IV Sourcing and Transportation **9**

Sourcing decision in supply chain - Third and Fourth – Party Logistics providers - Supplier scoring and assessment - Transportation in a Supply Chain – Risk and Trade-offs in transportation design.

UNIT V Information Technology in a Supply Chain **9**

Information technology in a supply chain – Impact and benefits of IT in supply chain management-CRM, ISCM, SRM in supply chain - Over view of recent trends in Supply Chain: e-SRM, e-LRM, e-SCM.

Total hours: 45

COURSE OUTCOMES:

CO-1: Analyze the manufacturing operations of a firm

CO-2: Apply sales and operations planning, MRP and lean manufacturing concepts

CO-3: Apply logistics and purchasing concepts to improve supply chain operations

CO-4: Apply quality management tools for process improvement

CO-5: Analyze – Risk and Trade-offs in transportation design.

TEXT BOOKS

1. Sunil Chopra and Peter Meindl, “Supply Chain Management-Strategy PlanningIndian Reprint, 2010.
2. Jananth Shah “Supply Chain Management – Text and Cases“, Pearsonand Operation”, Pearson Education, 4th Education, 2008.

REFERENCE BOOKS

1. Altekar Rahul V, “Supply Chain Management-Concept and Cases”, PrenticeHall India, 2005.
2. Monczka et al., “Purchasing and Supply Chain Management”, ThomsonLearning, 2nd Edition, 2 Reprint, 2002.

15EPE157 Total Quality Management 3 0 0 2

Course Objectives: To understand the various principles, practices of TQM to achieve quality. To get acquainted with the various statistical tools and approaches for quality control and continuous improvement.To get aware of the importance of ISO and Quality Systems.

UNIT I INTRODUCTION 8

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs -Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts,Role of Senior Management, Quality Council, Quality Statements, StrategicPlanning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES 7

Customer satisfaction – Customer Perception of Quality, CustomerComplaints, Service Quality, Customer Retention, Employee Involvement –Motivation, Empowerment, Teams, Recognition and Reward, PerformanceAppraisal, Benefits.

UNIT III TQM IMPROVEMENT PROCESS 8

Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen,Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating,Relationship Development, Performance Measures – Basic Concepts,Strategy, Performance Measure.

UNIT IV STATISTICAL PROCESS CONTROL (SPC) 8

The seven tools of quality, Statistical Fundamentals – Measures of centralTendency and Dispersion, Population and Sample, Normal Curve, ControlCharts for variables and attributes, Process capability, Concept of six sigma,New seven Management tools.

UNIT V TQM TOOLS 7

Benchmarking – Reasons to Benchmark, Benchmarking Process, QualityFunction Deployment (QFD) – House of Quality, QFD Process, Benefits,Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept,Improvement Needs, FMEA – Stages of FMEA.

UNIT VI QUALITY SYSTEMS 7

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System– Elements, Implementation of Quality System, Documentation, QualityAuditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

Total hour: 45

COURSE OUTCOMES:

CO-1: Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.

CO-2: Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality.

CO-3: Critically appraise the organisational, communication and teamwork requirements for effective quality management

CO-4: Critically analyse the strategic issues in quality management, including current issues and developments, and to devise and evaluate quality implementation plans

CO-5: Students will be knowledgeable on Taguchi method, service quality management, quality audits and Six Sigma to control quality in every sphere of activity in an organization.

TEXT BOOKS

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education,Inc. 2003.
2. Feigenbaum.A.V., "Total Quality Management", McGraw-Hill, 1991.
3. Narayana V. and Sreenivasan. N.S., "Quality Management – Concepts andTasks", New Age International, 1996.

REFERENCE BOOKS

1. James R.Evans& William M.Lidsay, "The Management and Control of Quality",5th Edition, South-Western (Thomson Learning), 2002.
2. Oakland.J.S., "Total Quality Management", Butterworth Hcinemann Ltd., Oxford,1989.
3. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers, 1998.

SYLLABUS

ABILITY ENHANCEMENT COMPULSORY COURSE(AECC)

15EPE201 English for Engineers-I (AECC-I) 2 1 0 3

Course Objectives: To develop students' aural competency and language fluency and to develop students' reading skills and to enable them to skim the text for the main idea, to scan the text for the specific information, to interpret the text and to deduce the meaning from the context. To train students in organized academic and professional writing. To help the students' achieve proficiency in the effective use of language in various career - related situations.

UNIT I Skill Development **9**

Listening Skills, Speaking Skills, Communication Skills, Telephone Skills.

UNIT II WRITING SKILLS **9**

Paragraph Writing, Description &Narration, Letter Writing, Note Making

UNIT III PRECISE WRITING & ABSTRACTING **9**

Precise &Abstract writing, Report Writing, Remedial Grammar

UNIT IV JOB-RELATED COMMUNICATION **9**

Preparation of Curriculum Vitae, Preparation for interview, preparation for group discussion

UNIT V READING HABITS **9**

Developing reading habits, Vocabulary, Reading Comprehension

Total hours: 45

COURSE OUTCOMES:

Specific learning outcomes for English courses include the following:

CO-1 Reading: Students will become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

CO-2 Writing skills and process: Students will be able to write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry, engaging other writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness of and confidence in their own voice as a writer.

CO-3: Sense of Genre: Students will develop an appreciation of how the formal elements of language and genre shape meaning. They will recognize how writers can transgress or subvert generic expectations, as well as fulfill them. And they will develop a facility at writing in appropriate genres for a variety of purposes and audiences.

CO-4 Research Skills: Students will be able to identify topics and formulate questions for productive inquiry; they will identify appropriate methods and sources for research and evaluate critically the sources they find; and they will use their chosen sources effectively in their own writing, citing all sources appropriately.

CO-5 Oral communication skills: Students will demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively: listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly; and situating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize, and deliver an engaging oral presentation.

TEXT BOOK

1. S P DHanavel, English and communication skills for students and engineering, Orient Black swan

REFERENCE BOOKS

1. Cambridge Advanced Learner's Dictionary - Paperback Edition With CD
2. Wrenn and Martin, English grammar

15EPE202 Environmental Science 2 1 0 3

Course Objectives: To develop the students' understanding in environmental related issues such as environmental, air, water and soil pollution**,** need for public awareness**,** natural resources and biodiversity**,** Renewable and non-renewable resources, threats to biodiversity, etc.

UNIT I Environmental awareness **9**

Environmental awareness: Multidisciplinary nature of environmental Science, Definition, Scope, Importance and need for public awareness. Ecology and Environment: Concept of an ecosystem, structure and function of an ecosystem, producer consumer and decomposer, energy and nutrient flow biogeochemical cycles, food chain, food web, ecological pyramid.

UNIT II Environmental Pollution **9**

Environmental Pollution: Segments of environment, sources, pathways and face of environmental pollutants, causes of environmental pollution - physical, chemical and biological transformation of pollutants, population explosion, environment and human health, human rights, value education, women and child welfare.

UNIT III Air Pollution **9**

Air Pollution: Various segments of atmosphere and their significance, classification of air pollutants, toxic effects, sampling and analysis, stationary and mobile emission, sources and their control, photochemical smog, sulphurous smog, green house effect, global warming, ozone depletion, Air (prevention and control of pollution) Act.

UNIT IVWater pollution **9**

Water pollution: Water resources, sources of water pollution, various pollutants, their toxic effect, portability of water, municipal water supply, disinfection, characteristics of waste, primary and secondary waste water treatment, BOD and COD measurement and their significance, rain water harvesting, water shed management, Water (pollution and control) Act.

UNIT V Natural Resources and Biodiversity **9**

Natural Resources and Biodiversity: Renewable and renewable resources, Forest resources, consequences of deforestation, floods and draughts, equitable use of resources for sustainable development. Dams benefits and problems. Biodiversity: Ecosytsem diversity, threats to biodiversity, conservation of biodiversity.A brief introduction to Noise Pollution, Soil Pollution, solid Waste Management.

Total hours: 45

COURSE OUTCOMES:

CO-1:To understand the nature and facts about environment.

CO-2: To find and implement scientific, technological, economic solutions to environmental problems.

CO-3: To know about the interrelationship between living organisms and environment.

CO-4: To understand the integrated themes and biodiversity, natural resources, pollution control and waste management.

CO-5: To appreciate the importance of environment by assessing its impact on the human world.

CO-6: To study the dynamic processes and understand the features of the earth's interior and surface.

CO-7: To know about what is the role of an individual in Conservation of Natural Resources.

CO-8: To know about the various social issues.

CO-9: To understand the role of government in solving the environmental problems.

CO-10: To know about Population Growth and variation among Nations

TEXT BOOK

1. Dr. V. Balasubramaniam, Dr. Sreedevi, Dr. G. Ramachandran, Environmental Science, CARS Publishers, West mambalam, Chennai-33

REFERENCE BOOKS

1. De AK. Environmental Chemistry, Wiley Eastern Ltd.
2. Miller T.G. Environmental Science, Wadsworth Publishing Co. (TE)
3. Sharma B.K.2001, Environmental Chemistry, Gael Publishing House, Meerut Odem,

15EPE203 English for Engineers-II (AECC-III) 2 0 0 3

Course Objectives: To develop students' aural competency and language fluency and to improve grammar, accent, pronunciation, their reading, writing and listening skills, sentence formation, conversation skills, verbal communication skills, importance of international standard accent, etc.

UNIT I Grammar **9**

Different Types of Sentences, Transformation of Sentences, Structure of Sentences Concord, QuestionTags.

UNIT II Accent & Pronunciation **9**

What is an Accent? Indian Accent, MTI (Mother Tongue Influence), GME (General American English) & RP (Received Pronunciation UK). The Importance International Standard Accent – IPA (International Phonetic Association).The Importance of Consonant Sounds in Pronunciation, Intonation & Word Stress, Often Mispronounced words, DO's & Don'ts in English Conversation, Pronunciation of ''The" Before Vowels & Consonants, Pronunciation of ''R'' Before Vowels & Consonants, Use of Articles Before Vowels and Consonants, Verbal & Non – verbal Communication Developing, Communication Skills.

UNIT III Soft Skills **9**

Presentation Skills, Group Discussion, Extempore Speech, Interview, Power Point Presentation & Techniques – Dos and Don'ts.

UNIT IV Writing Skills **9**

Types of Reports & Report Writing

UNIT V Reading & Listening Skills **9**

Reading & Listening Techniques

Total hours: 45

COURSE OUTCOMES:

CO-1:Students will become familiar with the purposes, audiences, and conventions of written communication in the contexts they expect to work in after graduation: industrial, governmental, and applied research environments.

CO-2:They will learn to recognize and construct effective arguments for a variety of audiences and to adapt these to the formats and conventions of various documents and genres.

CO-3:They will learn the relationships between written communication and oral and visual supplements.

CO-4:They will practice precision, clarity, and appropriateness of verbal expression for different readers.

CO-5:They will experience writing as a process, including planning, drafting, reviewing, revising, and criticizing.

TEXT BOOK

1. Cambridge Advanced Learner's Dictionary - Paperback Edition With CD

REFERENCE BOOKS

1. Strengthen Your Writing - V R Narayanswami; Orient Longman Private Ltd.
2. A Course in Listening and Speaking Book II - B Sasikumar,

SYLLABUS

SKILL ENHANCEMENT COURSES (SEC)

Skill Enhancement Course

15EPE251 Personality Development (SEC-I) 1 0 1 1

Course Objectives: To develop students skill in communication, listening, presentation, public speaking , body language, personal etiquette's, behavior with colleagues and subordinates, group discussions, leadership qualities, etc.,
Development of Soft Skills such as:

- Communication skill -
- Listening,
- Presentation,
- Public Speaking etc

Total hours: 40

15EPE252 National Services Scheme (SEC-II) 0 0 2 1

Unit – 01: Citizenship (7)

a) Basic Features of Constitution of India (2)
b) Fundamental Rights and Duties (2)
c) Human Rights (1)
d) Consumer awareness and legal rights of the consumer (1)
e) RTI (1)

Unit – 02: Family and Society (6)

a) Concept of family, community, (PRIs and other community-based organizations) and society (2)
b) Growing up in the family – dynamics and impact (1)
c) Human values (1)
d) Gender justice (2)

Unit – 03: Health, Hygiene & Sanitation (7)

a) Definition, needs and scope of health education (1)
b) Food and Nutrition (1)
c) Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyam) (2)
d) National Health Programme (2)
e) Reproductive health (1)

Unit – 04: Youth Health (6)

a) Healthy Lifestyles (1)
b) HIV AIDS, Drugs and Substance abuse (2)
c) Home Nursing (1)
d) First Aid (2)

Unit – 05: Youth and Yoga (9)

a) History, philosophy and concept of Yoga (2)
b) Myths and misconceptions about yoga (1)
c) Different Yoga traditions and their impacts (2)
d) Yoga and Preventive, promotive, and curative method (2)
e) Yoga as a tool for healthy lifestyle (2)

Project Work/Practical
Preparation of research project report 40 Marks

15EPE253 Soft Skill (SEC-III) 0 0 2 1

Course Objectives: To understand and develop student's ability on aspects such as logical thinking, reasoning, problem solving aptitude and adaptability, willingness to undertake challenging tasks, etc.
Development of the following Soft Skills-

1. Logical Thinking
2. Reasoning
3. Problem Solving Aptitude
4. Adaptability

Total hours: 40