JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. PETROLEUM ENGINEERING

COURSE STRUCTURE & SYLLABUS (2016-17)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA301BS	Mathematics - IV	4	1	0	4
2	PE302ES	General Geology	3	0	0	3
3	PE303ES	Surveying and Offshore Structures	3	0	0	3
4	PE304ES	Chemical Process Calculations	4	1	0	4
5	PE305ES	Elements of Mechanical Engineering	4	0	0	4
6	PE306ES	Geology Lab	0	0	3	2
7	PE307ES	Basic Engineering (Mechanical + Electrical) Lab	0	0	3	2
8	PE308ES	Surveying Lab	0	0	3	2
9	*MC300HS	Gender Sensitization Lab				-
		Total Credits	**18**	**2**	**9**	**24**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PE401ES	Petroleum Geology	4	0	0	4
2	PE402ES	Chemical Engineering Fluid Mechanics	4	1	0	4
3	PE403ES	Process Heat Transfer	4	1	0	4
4	SM405MS	Business Economics and Financial Analysis	3	0	0	3
5	PE404ES	Petroleum Exploration Methods	3	0	0	3
6	PE406ES	Chemical Engineering Fluid Mechanics Lab	0	0	3	2
7	PE407ES	Process Heat Transfer Lab	0	0	3	2
8	PE408ES	Mathematical Methods for Petroleum Engineers Lab	0	0	3	2
9	*MC400ES	Environmental Science and Technology	3	0	0	0
		Total Credits	**21**	**2**	**9**	**24**

MA301BS: MATHEMATICS - IV
(Complex Variables and Fourier Analysis)

B.Tech. II Year I Sem.	**L**	**T/P/D**	**C**
	4	**1/0/0**	**4**

Prerequisites: Foundation course (No Prerequisites)**.**

Course Objectives: To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

Course Outcomes: After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in term of sines and cosines
- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation

UNIT–I

Functions of a complex variable: Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method

UNIT-II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

UNIT–III

Evaluation of Integrals: Types of real integrals:

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

Bilinear transformation- fixed point- cross ratio- properties- invariance of circles.

UNIT–IV

Fourier series and Transforms: Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, inverse transforms, Finite Fourier transforms.

UNIT–V

Applications of PDE: Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.

TEXT BOOKS:

1. A first course in complex analysis with applications by Dennis G. Zill and Patrick Shanahan, Johns and Bartlett Publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
3. Advanced engineering Mathematics with MATLAB by Dean G. Duffy

REFERENCES:

1. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
2. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.

PE302ES: GENERAL GEOLOGY

B.Tech. II Year I Sem.

L	T/P/D	C
3	0/0/0	3

Prerequisites: None

Course Objective: To expose the students to different geological environments, which relate to petroleum industry

Course Outcome: The student would understand the basics of geology, viz: formation of earth, layers of earth, different types of rocks, formation of sedimentary basins and the micro fossils and their relationship to oil and gas.

UNIT- I

Dimensions of earth, structure, composition and origin of earth-envelops of the Earth- crust, mantle, core. Internal dynamic process- Plate tectonics- continental drift, Earthquake and volcanoes. External dynamic process- weathering, erosion and deposition.

UNIT-II

Fundamental concepts in Geomorphology-geomorphic processes distribution of landforms-drainage patterns –development, Landforms in relation to rocks types, paleochannels, buried channels.

UNIT-III

Geological work of rivers, wind, Ocean and glaciers and the landforms created by them.

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UNIT-IV

Origin of igneous, sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, sandstone, shale, limestones.

Introduction to sedimentary basins and deltaic systems. Topographic maps, thematic maps, Topographic and thematic profiles.

UNIT-V

Palaeontology: Introduction to Palaeontology, Fossils and Fossilization.

Micropaleontology - Palynology: Distribution of microfossils-Foraminifera, Radiolaria, Conodonts, Ostracodes, Diatoms. Importance of micro fossils in oil exploration.

TEXT BOOK:

1. Engineering Geology, F. G. Bell, 2nd Edition, Butterworth Heimann, 2007.

REFERENCE BOOKS:

1. Text book of Geology, P.K Mukharjee, The World Press Pvt Ltd., Calcutta, 2005.
2. Rutleys Elements of Mineralogy, 27 Ed., N.H.Read, Allen & Unwin Australia 1988.

PE303ES: SURVEYING AND OFFSHORE STRUCTURES

B.Tech. II Year I Sem.	L	T/P/D	C
	3	0/0/0	3

Prerequisites: None

Course Objectives: The students will be trained to:

- Demonstrate the principles of surveying for the measurement of distance and angles.
- Explain the concepts of levelling and contouring.
- Introduce the concepts of advanced surveying and implementation in shoreline surveying.
- Demonstrate the principles of sea surveying.
- Introduce the concepts of wave and current data collection.
- Explain various stages of fixed offshore structure in view of the operation.
- Introduce the concept and types of compliant structures.
- Demonstrate the basic terminology and floatation principles of floating structures.

Course Outcomes: After successful completion of the course, the student can understand:

- The basic principles and significance of measurement of distance and direction.
- Horizontal and vertical angles.
- Principles, importance and measurement of angles using Theodolite.
- Concepts and terminology in contour mapping.
- Measurement and to plotting the contour maps.
- Basics of total station and GPS.
- Shore line survey and basics of acoustics, application in the field.
- Basics of sea surveying and bathymetry, importance of bathymetry survey, seismic survey, positioning and wave and current data collection and significance of data collection.
- Types and functions of fixed offshore structures, methodology of fabrication transportation, installation and operation of fixed offshore structures, Significance and types of compliant structures.
- The basic principles of floatation and stability of floating structures.
- Stability criteria of neutrally and positively buoyant structures.

UNIT–I

Distance and Direction: Objectives, Principles and classifications of Surveying, chain, tape, Electronic distance measurements, Meridians Azimuths and Barings, declination, computation of angle.

Theodolite: Theodolite, description, uses and adjustments – temporary, measurement of horizontal and vertical angles. Principles of Electronic Theodolite.

UNIT-II

Levelling and Contouring: Concept and Terminology, Temporary- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT-III

Introduction to Advanced Surveying: Total Station and Global positioning system and Differential GPS.

Hydrographic surveying: Introduction- Shoreline Surveys- Sounding Methods (Bathymetry).

UNIT–IV

Subsea surveying and Geomatics, introduction to the principles of subsea surveying and geomatics is including bathymetry and seismic survey, positioning systems (surface positioning, visual positioning techniques) distance from shore & water depth, generation of surface waves in oceans, wave data collection, and current data collection.

UNIT–V

Functions of offshore structures, fixed offshore structures, types of fixed structures, fabrication, transportation, installation and operation of offshore structures, construction of offshore concrete structures, definition of compliant structures, types of complaint structures.
Floating structures, basic hydrostatics, Centre of gravity, center of buoyancy, displacement, law of floatation, draft, keel, Simpson's rule for areas and centroids, second moments of area, moments of inertia, mass moment of inertia, calculation of metacentric height, stability of floating structures, definition of neutrally and positively buoyant structures.

TEXT BOOKS FOR UNITS I-III:

1. Surveying (Vol – 1, 2) ; Higher Surveying, Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain , Vol 3, Laxmi Publications, 2005.
2. Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill, 2004.
3. Text book of Surveying, Venkataramaiah, C., Universities Press, 1996.

TEXT BOOKS FOR UNITS IV-VI:

1. Handbook of Offshore Engineering, Subrata K. Chakrabarti, Volume 1, Elsevier, 2005.
2. Ship Stability for Masters and Mates, Barrass, C. B. and D. R. Derret, 7th Edition, Butterworth-Heinemann, 2012.
3. Construction of Marine and Offshore Structure, Gerwick, Jr., C., 3rd Edition, CRC Press, 2007.

PE304ES: CHEMICAL PROCESS CALCULATIONS

B.Tech. II Year I Sem.	L	T/P/D	C
	4	1/0/0	4

Prerequisites: Engineering Mathematics, Engineering Physics, Engineering Chemistry

Course Objective: To introduce calculations for both material and energy balances for different industrial processes. It is prerequisite for several other courses in the curriculum, including courses like process dynamics, heat transfer and thermodynamics.

Course Outcome: The student would be in a position to have knowledge of chemical engineering calculations, which is a pre-requisite for several other courses in the syllabus.

UNIT-I

Stoichiometric & Composition relations: Stoichiometric relation, basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales.

Behavior of Ideal gases: Kinetic theory of gases, application of ideal gas law, gaseous mixtures, gases in chemical reactions.

UNIT-II

Vapour pressure: Liquefaction and liquid state, vaporization, boiling point, effect of temperature on vapour pressure, Antoine equation, vapour pressure plots, estimation of critical properties, vapour pressure of immiscible liquids and ideal solutions, Raoult's law, Non volatile solutes.

Humidity and Saturation: Partial saturation, Humidity- Absolute Humidity, Vaporization process, Molal humidity, Relative and percentage saturation, dew point, humid heat, wet bulb and dry bulb temperatures, use of humidity charts, adiabatic vaporization.

UNIT-III

Material balances: Tie substance, Yield, conversion, limiting reactant, excess reactant, processes involving reactions, Material balances with the help of Stoichiometric equations, Material balances involving drying, dissolution, & crystallization. Material balance calculations for processes involving recycle, bypass and purge.

UNIT-IV

Thermo physics: Energy, energy balances, heat capacity of gases, liquid and mixture solutions. Kopp's rule, latent heats, heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non polar liquids enthalpy and its evaluation.

Thermo chemistry: Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchhoff's equation, enthalpy concentration change, calculation of theoretical and actual flame temperatures.

UNIT-V

Combustion Calculations: Introduction, fuels, calorific value of fuels, coal, liquid fuels, gaseous fuels, air requirement and flue gases, combustion calculations, incomplete combustion, material and energy balances, thermal efficiency calculations.

TEXT BOOK:

1. Chemical process principles, Part -I, Material and Energy Balance, Hougen O A, Watson K.M. and Ragatz R.A. 2nd Edition, John Wiley and Sons, New York, 1963.

REFERENCE BOOKS:

1. Basic principles and calculations in chemical engineering by D.H. Himmelblau, 7th Ed. PHI, 2013
2. Stoichiometry by B.I. Bhatt and S.M. Vora (3rd Ed.) Tata McGraw Hill publishing company, Ltd. New Delhi (1996)

PE305ES: ELEMENTS OF MECHANICAL ENGINEERING

B. Tech. II Year I Sem.	L	T/P/D	C
	4	0/0/0	4

Prerequisites: None

Course Objective: To give an insight to students about the behaviour of materials under external forces. The concept of stress, strain, elasticity etc. as applied to various structures under loading are included.

Course Outcome: The student would be exposed to basic mechanical engineering machinery.

UNIT-I

Stresses and strains: kinds of – stress-strains, elasticity and plasticity, Hooks law, stress – strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses.

UNIT-II

Types of supports – loads – Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads. Theory of simple bending, simple bending formula, Distribution of Flexural and Shear stress in Beam section – Shear stress formula – Shear stress distribution for some standard sections.

UNIT-III

Thin cylindrical shells: stress in cylindrical shells due to internal pressures, circumferential stress, longitudinal stress, design of thin cylindrical shells, spherical shells, change in dimension of the shell due to internal pressure, change in volume of the shell due to internal pressure

Thick Cylinders: Lame's equation- cylinders subjected to inside and outside pressures Columns and Struts.

UNIT-IV

Internal combustion engines: classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT-V

Belts –Ropes and chain: belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems.

Gear trains: classification of gears, gear trains velocity ratio, simple, compound –reverted and epicyclic gear trains.

TEXT BOOKS:

1. "Strength of Materials and Mechanics of Structures", B.C.Punmia, Standard Publications and distributions, 9 th ed. (units I – III)
2. Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003 (Units IV.
3. Theory of Machines, S.S. Rattan , Tata McGraw Hill (Units V).

PE306ES: GEOLOGY LAB

B.Tech. II Year I Sem.

L	T/P/D	C
0	0/3/0	2

Prerequisites: Basic knowledge of Geology

Course Objectives:

- The students should be in a position to
- read, understand and interpret the supplied maps
- understand the steps to be followed for completing any field job successfully

Course Outcomes: The student will be in a position to

- read, understand and interpret different maps like Toposheet, Structural Geology maps, Stratigraphic maps, geological cross-sections, Isopach maps, Structural Contour maps etc.
- understand how to locate own / outcrop positions on Toposheet and how to take traverse
- understand geological formations and measure dip and strike reading correctly in the filed
- calculate true dip, true thickness, Oil Water Contact (OWC) from given maps
- explain different sediment depositional environments from stratigraphic columns

List of Experiments:

1. Study of physical properties of minerals in hand specimen
2. Study of common rocks with reference to their common structures, mineral composition and uses.
3. Identification of minerals under microscopes
4. Identification of rocks under microscopes
5. Location of observed outcrops on the Toposheet. Geological mapping and Traversing.
6. Measurement of the strike and dip in the field
7. Interpretation of Topographic Maps
8. Interpretation of Geological Maps: (1) Attitude, (2) Cross-sections, (3) Unconformable beds, (4) Folded beds, (5) Faults and geological intrusions (dykes and sills)
9. Interpretation of isopach maps
10. Interpretation of litho stratigraphic columns and litho stratigraphic correlation
11. Interpretation of structural contour map and location of Oil Water Contact (OWC)
12. Interpretation of isopach map and depositional model.
13. Estimation of Thickness, Distance, and Depth of subsurface Ore Bodies

PE307ES: BASIC ENGINEERING (MECHANICAL + ELECTRICAL) LAB

B.Tech. II Year I Sem.

L	T/P/D	C
0	0/3/0	2

Section A: Mechanical Engineering Laboratory:

Course Objective: To impart practical exposure on the performance evaluation methods of various mechanical components like, I. C. Engine, Hydraulic turbine, hydraulic pump, Air compressor etc. and also understand the various processes that can be performed on a lathe machine.

Course Outcome: The student will be able to predict the performance of several mechanical components and operate a lathe machine to produce the required job work.

List of Experiments

1. Draw the valve timing diagram of a 4-stroke diesel engine and port timing diagram of a 2-stroke petrol engine.
2. Perform load test on a 4-stroke I.C .Engine and draw the performance curves.
3. Pattern design and making – for one casting drawing.
4. Taper turning and thread cutting on a Lathe machine.
5. Performance on an Impulse/Reaction Hydraulic Turbine.
6. Performance of Centrifugal/Reciprocating Pump.
7. Find the volumetric efficiency, isothermal efficiency of an Air compressor.

Section B: Electrical Engineering Laboratory

Course Objectives: This course imparts knowledge to the students to:

- Learn the estimation of efficiency of a DC machine as motor & generator.
- Learn the estimation of efficiency of transformer at different load conditions & power factors.
- Study the performance of a 3-Phase induction motor by conducting direct test.
- Pre-determine the regulation of an alternator by Synchronous impedance method.
- Understand the speed control of a DC shunts motor.
- Study the performance of a DC shunts motor by conducting direct test.

Course Outcomes: After successful completion of the course, the students will be able to:

- Estimate the efficiency of a DC machine as motor & generator.
- Estimate the efficiency of transformer at different load conditions & power factors.
- Understand the performance of a 3-Phase induction motor by conducting direct test.
- Pre-determine the regulation of an alternator by Synchronous impedance method.
- Control the speed of a DC shunt motor by Field flux control method & Armature Voltage control method.

- Understand the performance characteristics of a DC shunt motor by conducting direct test.

List of Experiments:

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C Shunt Motor

PE308ES: SURVEYING LAB

B.Tech. II Year I Sem.	L	T/P/D	C
	0	0/3/0	2

Prerequisites: Basic knowledge of Civil Engineering and Survey

Course Objectives:

- To have the ability for applying knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying
- To gain an appreciation of the need for lifelong learning through the discussion of recent changes in survey procedures and equipment
- To have the ability for using techniques, skills, and modern engineering tools necessary for engineering practice
- To build the ability for working as a member of a team
- To understand the importance of professional licensure to protect the public in the practice of land surveying.

Course Outcomes: After the completion of the said lab, the students will

- appreciate the need for accurate and thorough note taking in field work to serve as a legal record
- gain the ability to use modern survey equipment to measure angles and distances
- gain a basic understanding of the principles and operation of the Global Positioning System
- gain the ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork
- improve ability to function as a member of a survey party in completing the assigned field work
- Appreciate the need for licensed surveyors to establish positioning information for property and structures.

List of Experiments:

- Study of linear measuring instruments and chain surveying.
- Study of theodolite and traversing with theodolite,
- Study of levels and ordinary levelling with tilting level, Profile levelling,
- Study of total station and measurement with total station.
- Study of Global Positioning System (GPS) and measurement with GPS.
- Determination of distance between two inaccessible points with compass.
- Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment
- Radiation method and Intersection method by plane table survey.
- Two point problems in plane table survey.
- Three point problems in plane table survey.
- Traversing by plane table survey.
- Fly levelling (differential levelling)

MC300HS: GENDER SENSITIZATION LAB

B.Tech. II Year I Sem.

L	T/P/D	C
0	0/3/0	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT – I

UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)

Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit-4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10)

Two or Many? Struggles with Discrimination.

UNIT – III
GENDER AND LABOUR
Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT – IV
ISSUES OF VIOLENCE
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
GENDER : CO - EXISTENCE
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Prescribed Textbook : All the five Units in the Textbook**, *"Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. *"I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

PE401ES: PETROLEUM GEOLOGY

B.Tech. II Year II Sem.	L	T/P/D	C
	4	0/0/0	4

Prerequisites: General Geology

Course Objective: To expose the students to different source, reservoir and cap rocks, hydrocarbon migration and generation of oil and gas from sediments.

Course Outcome: The students will learn different source, reservoir and cap rocks, concepts of porosity, permeability and their relation to hydrocarbon migration and entrapment. Temperature-pressure conditions for the generation of oil and gas from organic rich sediments.

UNIT-I

Source Rocks: Definition of source rock. Organic rich sediments as source rocks. Nature and type of source rocks - Claystone / shale. The process of diagenesis, catagenesis and metagenesis in the formation of source rocks. Evaluation of petroleum source rock potential. Limestone as source rocks. Subsurface pressure temperature conditions for the generation of oil and gas from the source sediments. Oil window.

UNIT-II

Reservoir Rocks: Characteristics of Reservoir rocks – classification and nomenclature: Clastic Reservoir Rocks, Carbonate Reservoir Rocks, Unconventional, fractured and miscellaneous reservoir rocks. Marine and non-marine reservoir rocks.

Reservoir pore space - porosity – primary and secondary porosity, Effective porosity, fracture porosity - permeability – effective and relative permeability Relationship between porosity, permeability and texture. Cap rocks: Definition and characteristics of 'cap Rocks'.

UNIT-III

Hydrocarbon Migration: Geological framework of migration and accumulation. The concept of hydrocarbon migration from source beds to the carrier beds - Carrier beds to the reservoir - Free-path ways for migration - Short distance and long distance migration - Evidence for migration – oil and gas seepages.

UNIT-IV

Entrapment of Hydrocarbons: Entrapment and accumulation of hydrocarbons - Classification and types of traps: Structural, stratigraphic and combination type of traps - Traps associated with salt domes.

UNIT-V

Sedimentary Basins: Sedimentary basins -origin and classification. Types of basins and their relationship to hydrocarbon prospects. Tectonic classification, stratigraphic evolution and

hydrocarbon accumulations of the following basins: Krishna-Godavari basin, Cambay basin and Mumbai off-shore

TEXT BOOK:

1. Levorsen, A.I. Geology of Petroleum, 1967, 2nd Edn., CBS, New Delhi.

REFERENCE BOOKS:

1. Richard, C. Selley, 1998. Elements of Petroleum Geology, Academic Press, London
2. Sedimentary basins of India- ONGC bulletin.

PE402ES: CHEMICAL ENGINEERING FLUID MECHANICS

B.Tech. II Year II Sem.

L	T/P/D	C
4	1/0/0	4

Prerequisites: Engineering Mathematics, Engineering Physics

Course Objective: To introduce the concepts, principles, laws, observations and models of fluids at rest and in motion and also to provide the basis for understanding the fluid behavior, engineering design and control of fluid systems.

Course Outcomes: The student would be able to get knowledge related to compressible & incompressible fluids and also transportation of fluids.

UNIT-I

Unit operations and unit processes, unit systems, basic concepts, nature of fluids, hydrostatic equilibrium, applications of fluid statics.

Fluid flow phenomena-Laminar flow, Shear rate, Shear stress, Rheological properties of fluids, Turbulence, Boundary layers, Basic equation of fluid flow –Mass balance in a flowing fluid; continuity equation, differential momentum balance; equations of motion, Macroscopic momentum balances, Bernoulli equation, pump work in Bernoulli equation.

UNIT-II

Incompressible Flow in pipes and channels- shear stress and skin friction in pipes, laminar flow in pipes and channels, turbulent flow in pipes and channels, friction from changes in velocity or direction, Dimensional analysis including Buckingham π Theorem and Rayleigh's method.

UNIT-III

Flow of compressible fluids- Definitions and basic equations, Processes of compressible flow, Isentropic flow through nozzles, adiabatic frictional flow, and isothermal frictional flow.

UNIT-IV

Flow past immersed bodies, Drag and Drag coefficient, friction in flow through beds of solids, Kozeny-Carman, Blake-Plummer and Ergun equations, and motion of particles through fluids.

Fluidization, Conditions for fluidization, Minimum fluidization velocity, Types of fluidization, Expansion of fluidized beds, Applications of fluidization. Continuous fluidization; slurry and pneumatic transport.

UNIT-V

Transportation and Metering of fluids- Pipes, fittings and valves, Fluid- moving machinery, Fans, blowers, and compressors.

Measurement of flowing fluids- variable head meters- Orifice meter, Venturi meter, Pitot tube; Area meters- Rota meter.

TEXT BOOKS:

1. Unit Operations of Chemical Engineering by W.L.McCabe, J.C.Smith & Peter Harriot, McGraw-Hill, 7th ed, 2007
2. Chemical Engineering Fluid Mechanics by Ron Darby, 2nd Edition, CRC press, Taylor & Francis group,2001

REFERENCE BOOKS:

1. Transport processes and unit operations by Christie J. Geankoplis, PHI
2. P rinciples of Unit Operations, Foust *et al*, 2nd ed., John Wiley, 1999
3. Chemical Engineering, Vol-I, Coulson and Richardson, Pergamon Press

PE403ES: PROCESS HEAT TRANSFER

B.Tech. II Year II Sem.	L	T/P/D	C
	4	1/0/0	4

Prerequisites: Engineering Mathematics, Engineering Physics

Course Objective: The objective of this course is to understand the principles of heat transfer (conduction, convection and radiation) and also principles and working of heat transfer equipments.

Course Outcome: The student would be in a position to design of heat transfer equipments which are used in the process industry.

UNIT-I

Introduction: Nature of heat flow, conduction, convection, natural and forced convection, radiation.

Heat transfer by conduction in Solids: Fourier's law, thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series, heat flow through a cylinder, conduction in spheres.

Unsteady state heat conduction: Equation for one-dimensional conduction, Semi-infinite solid.

UNIT-II

Principles of heat flow in fluids: Typical heat exchange equipment, countercurrent and parallel current flows, energy balances, rate of heat transfer, overall heat transfer coefficient, electrical analogy, critical radius of insulation, logarithmic mean temperature difference, variable overall coefficient, multi-pass exchangers, individual heat transfer coefficients, resistance form of overall coefficient, fouling factors, classification of individual heat transfer coefficients, magnitudes of heat transfer coefficients, effective coefficients for unsteady-state heat transfer.

UNIT-III

Heat Transfer to Fluids without Phase change: Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow, heat transfer by forced convection in turbulent flow, the transfer of heat by turbulent eddies and analogy between transfer of momentum and heat, heat transfer to liquid metals, heating and cooling of fluids in forced convection outside tubes.

UNIT-IV

Natural convection: Natural convection to air from vertical shapes and horizontal planes, effect of natural convection in laminar-flow heat transfer.

Heat transfer to fluids with phase change: Heat transfer from condensing vapors, heat transfer to boiling liquids.

Radiation: Introduction, properties and definitions, black body radiation, real surfaces and the gray body, absorption of radiation by opaque solids, radiation between surfaces, radiation shielding, radiation to semi transparent materials, combined heat transfer by conduction, convection and radiation.

UNIT-V

Heat exchange equipment: General design of heat exchange equipment, heat exchangers, condensers, boilers and calendrias, extended surface equipment, heat transfer in agitated vessels, scraped surface heat exchangers, heat transfer in packed beds, heat exchanger effectiveness (NTU method)

Evaporators: Evaporators, performance of tubular evaporators, capacity and economy, multiple effect evaporators, methods of feeding, vapor recompression.

TEXT BOOK:

1. Unit Operations of Chemical Engineering by W.L.McCabe, J.C.Smith & Peter Harriot, McGraw-Hill, 7^{th} ed, 2007

REFERENCE BOOKS:

1. Process Heat Transfer, D.Q. Kern, Tata McGraw-Hill, New Delhi, 1997.
2. Heat Transfer, 4^{th} ed., J.P. Holman, McGraw-Hill, New York, 1976.

SM405MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. II Year II Sem.	L	T/P/D	C
	3	0/0/0	3

Prerequisites: None

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT- III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT -V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D.Chaturvedi, S.L.Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N.Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

PE404ES: PETROLEUM EXPLORATION METHODS

B.Tech. II Year II Sem.	L	T/P/D	C
	3	0/0/0	3

Prerequisites: Basic knowledge of Geology and Petroleum Geology

Course Objectives: The syllabus for Petroleum Exploration should be aimed at the student to have a broad knowledge of exploration history in India. The student should know what are the basic methods which are used in petroleum exploration with special emphasis on gravity/magnetic and more importantly the students should understand in detail about the Seismic methods which are the back bone of the whole gamut of oil exploration.
At the same time sedimentology and biostratigraphy are also important to understand the sedimentary sequences holding hydrocarbons as the knowledge of these will help in the log interpretation also.

Course Outcomes: The outcome this is to give insight for the student to have a broad based understanding of the seismic exploration, viz its acquisition methods, processing and interpretation, as they have already had geology in 2ndyear course. The knowledge of these methods will go a long way along with the other paper i.e, logging methods for them to opt for upstream industry jobs if they so desire.

UNIT-I
Introduction: Overview of petroleum exploration in India, Introduction to Geophysical/Geological methods used in Petroleum Exploration.

UNIT-II
Sedimentlogical and biostratigraphic approaches in hydrocarbon exploration.

UNIT-III
Basic concepts of Gravity/Magnetic methods: Newton's gravitational law- Units of gravity- Gravity measuring instruments- Gravity survey- Gravity anomalies- Gravity data reduction- Drift- latitude- Elevation and free air correction- Free air &bouguer anomalies- Gravity response of simple shapes- Interpretation of gravity anomalies- Application of gravity methods. The geomagnetic field- Magnetic anomalies- Magnetic survey-instruments- Field method of magnetic surveys- Reduction of magnetic data-Diurnal correction and geomagnetic correction- Interpretation of magnetic anomaly- Response of magnetic method for different type of bodies and geological structure- Application of magnetic surveys both overland and from air.

UNIT-IV
Basic Concepts of seismic methods: Seismic refraction surveys- Geometry of refracted path, planar interface- Two layer case with horizontal interface- Methodology of refraction

profiling- Recording instruments & energy sources- Corrections applied to refraction data Interpretation of refraction data- Application of seismic refraction method.

UNIT-V

Geometry of reflected ray path: Single horizontal reflector- The reflection seismograph and seismogram (Seismic traces)- Importance of seismic reflection survey over seismic refraction survey technique- Common depth point (CDP) profiling & stacking- 2D, 3D, & 4D seismic surveys- Field procedures & principles- Time corrections applied to seismic data- Data processing - Introduction to 2D & 3D data acquisition &interpretationof reflection data for identification of drillable structures.

Well seismic shooting for velocity determination and Vertical Seismic Profiling (VSP).

Text Books:

1. Introduction to Geophysical Prospecting, Milton B. Dobrin, and Carl H. Savit, 4th Edition, McGraw Hill, 1988.
2. Outlines of Geophysical Prospecting: A Manual for Geologists, M.B. Ramachandra Rao, EBD Educational Pvt Ltd., 1993.
3. Field Geophysics, John Milsom and Asger Eriksen, 4th Edition, John Wiley, 2011.

Reference Books:

1. Elements of Geology: Oil and Gas Exploration Techniques, J. Guillemot, Technip 1991.
2. Hydrocarbon well logging recommended practice, Society of professional well log analysts.
3. Open – Hole log analysis and formation evaluation, Richard M. Batemons, International Human Resources Development Corporation, Bostan, 1985.
4. Well Logging for Earth Scientists, Darwin V. Ellis, Julian M. Singer, Springer, 2007.
5. Fundamentals of Well Log Interpretation: The Acquisition of Data, Oberto Serra, Elsevier, 1984.
6. Well Logging Handbook, Oberto Serra, Editions Technip, 2008.

PE406ES: CHEMICAL ENGINEERING FLUID MECHANICS LAB

B.Tech. II Year II Sem.	L	T/P/D	C
	0	0/3/0	2

Prerequisites: Basic knowledge of Fluid Mechanics

Course Objectives: The lab provides knowledge on various flow patterns, flow measuring devices and pumps.

Course Outcomes: Student will be able to understand the concept of fluid flow phenomena, different flow regimes, flow measuring devices like venturi, orifice and rotameter.

List of Experiments

1. Identification of laminar and turbulent flows
   Major equipment - Reynolds apparatus
2. Measurement of point velocities
   Major equipment - Pitot tube setup
3. Verification of Bernoulli's equation
   Major equipment – Bernoulli's Apparatus
4. Calibration of Rotameter
   Major equipment – Rotameter Assembly
5. Variation of Orifice coefficient with Reynolds Number
   Major equipment - Orifice meter Assembly
6. Determination of Venturi coefficient
   Major equipment – Venturi meter Assembly
7. Friction losses in Fluid flow in pipes
   Major equipment - Pipe Assembly with provision for Pressure measurement
8. Pressure drop in a packed bed for different fluid velocities
   Major equipment - Packed bed with Pressure drop measurement
9. Pressure drop and void fraction in a fluidized bed
   Major equipment - Fluidized bed with Pressure drop measurement
10. Studying the coefficient of contraction for a given open orifice
    Major equipment - Open Orifice Assembly
11. Studies of performance characteristics of a Reciprocating Pump
12. Studying the Characteristics of a centrifugal pump
    Major equipment - Centrifugal Pump

PE407ES: PROCESS HEAT TRANSFER LAB

B.Tech. II Year II Sem.	L	T/P/D	C
	0	0/3/0	2

Prerequisites: Basic knowledge of Process Heat Transfer

Course Objectives: This lab will provide practical knowledge on various heat transfer process and equipment like heat exchangers and evaporators

Course Outcomes: The student will be able to understand the thermal conductivity measurement, heat transfer coefficient, calculation in natural and forced convection and some of the radiation aspects.

List of Experiments

1. Determination of total thermal resistance and thermal conductivity of composite wall.
   Major equipment - Composite wall Assembly
2. Determination of thermal conductivity of a metal rod.
   Major equipment - Thermal Conductivity apparatus
3. Determination of natural convective heat transfer coefficient for a vertical tube.
   Major equipment - Natural convection heat transfer apparatus
4. Determination of critical heat flux point for pool boiling of water.
   Major equipment- Pool boiling apparatus
5. Determination of forced convective heat transfer coefficient for air flowing through a pipe
   Major equipment – Forced convection heat transfer apparatus
6. Determination of overall heat transfer coefficient in double pipe heat exchanger.
   Major equipment - Double pipe heat exchanger apparatus
7. Determination of heat transfer coefficient for a helical coil in an agitated vessel.
   Major equipment – Helical coil in a agitated vessel.
8. Study of the temperature distribution along the length of a pin-fin under natural and forced convection conditions
   Major equipment - Pin fin apparatus
9. Estimation of un-steady state film heat transfer coefficient between the medium in which the body is cooled.
   Major equipment - Heat transfer coefficient determination apparatus
10. Determination of Stefan – Boltzmann constant.
    Major equipment - Stefan Boltzmann apparatus
11. Determination of emissivity of a given plate at various temperatures.
    Major equipment - Emissivity determination apparatus
12. Determination of overall heat transfer coefficient in 1-2 heat exchanger.
    Major equipment - 1-2 heat exchanger

PE408ES: MATHEMATICAL METHODS FOR PETROLEUM ENGINEERS LAB

B.Tech. II Year II Sem.	L	T/P/D	C
	0	0/3/0	2

Prerequisites: Mathematical Methods

Course Objectives: The Lab emphasizes on writing MATLAB code, execution and doing what if analysis of the variations in the parameters for the given problems.

Course Outcomes: The Students will be able to

- apply mathematical methods to Petroleum Engineering Problems.
- write code in MATLAB.

List of problems:

1. Determination of Molar volume and Compressibility from Redlich-Kwong Equation
2. Calculation of flow rate in a pipeline
3. Correlation of the physical properties
4. Compressibility factor variation from vanderwaals equation
5. Isothermal compression of gas using Redlich-Kwong Equation of state
6. Thermodynamic properties of steam from Redlich-Kwong Equation
7. Solution of Stiff Ordinary Differential Equations
8. Iterative Solution of ODE boundary value problem
9. Shooting method for solving two-point boundary value problems
10. Expediting the solution of systems of nonlinear algebraic equations
11. Solving differential algebraic equations –DAEs
12. Method of lines for Partial Differential Equations
13. Estimating model parameters involving ODEs using fermentation data

TEXTBOOK:

1. Problem solving in Chemical and Biochemical Engineering with POLYMATH, Excel and MATLAB by Michael B. Cutlip and Mordechai Shacham, Prentice Hall, 2008.

MC400ES: ENVIRONMENTAL STUDIES

B.Tech. II Year II Sem.

L	T/P/D	C
3	0/0/0	0

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

Course Outcomes:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics

of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela . 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.