

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72713) ENHANCED OIL RECOVERY TECHNIQUES**Objectives:**

- Introduce the student to the theory and practices of improved oil recovery.
- Emphasize the potential of enhanced oil recovery methods in reservoir exploitation.

UNIT-I**Introduction:** Oil recovery processes.**Gas injection:** Introduction- Predictive performance- Gas injection in carbonate reservoirs- Inert gas injection- Candidates for gas injection.**UNIT-II****Miscible flooding:** Introduction- Sweep efficiency- High pressure gas injection- Enriched gas drive- LPG slug drive- Predictive technique- Field applications**Carbon dioxide flooding:** Process description- Field projects- CO₂ sources- problem areas- Designing a CO₂ flood- Guidelines for selection of miscible CO₂ projects- Immiscible CO₂ flooding Conclusions.**Polymer flooding:** Introduction- Polyacrylamides chemistry- Application of PAM/AA in enhanced oil recovery- Factors affecting flow in porous media- Field considerations- Site factors- Field operation.**UNIT-III****Alkaline flooding:** Introduction- Types of caustic used- Entrapment of residue oil- Displacement mechanisms in alkaline flooding- Crude oil properties- Alkali consumption- pH of injected caustic- Effect of sodium ions and sodium chloride.**In-situ combustion technology:** Introduction- Reservoir characteristics- Ignition- Ignition methods, Process In-situ Combustion- Use of In-situ Combustion- Current status of In-situ Combustion.**UNIT-IV****Use of surfactants in oil recovery:** Introduction- Classification of EOR surfactants- Mechanism of oil displacement by surfactant flooding- Ultra low interfacial tension in relation to oil displacement by surfactant flooding- Factors influencing oil recovery.**Steam flooding for enhanced oil recovery:** Introduction- Theory- Screening criteria for steam flood prospects- Reservoir rock and fluid properties- heat

losses and formation heating- oil recovery calculations- An overview of steamflood modeling, parametric studies in steam flooding- Economics of the steam flooding process.

UNIT-V

Microbial enhanced oil recovery: Microorganisms- Historical development of microbial enhancement of oil recovery- Laboratory experiments show the potential of microbial enhancement oil recovery- Field application of microbial enhancement of oil recovery-Microbes associated with oilfield problems.

Environmental factors associated with oil recovery: Introduction-Primary and secondary production-Chemical flooding-Micellar-polymer processes-Thermal processes- Gas flooding.

TEXT BOOK:

1. Enhanced Oil Recovery: Processes and Operations, E. C. Donaldson, G. V. Chilingarian, T. F. Yew, Elsevier, 1998.
2. Enhanced Oil Recovery, Larry W. Lake, Prentice Hall, 1998.

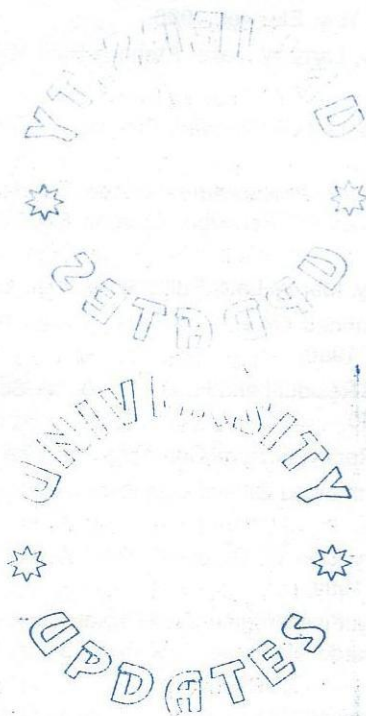
REFERENCE BOOKS:

1. Basic Concepts in Enhanced Oil Recovery Processes, Marc Baviere, SCI, 1991.
2. Enhanced Oil Recovery: Proceedings of the Third European Symposium on Enhanced Oil Recovery, F. John Fayers, Elsevier, 1981.
3. Enhanced Oil Recovery, Marcel Latil, Editions Technip, 1980.
4. Fundamentals of Enhanced Oil Recovery, H. R. Van Poilew and Associates, PennWell, 1980.
5. Enhanced Recovery of Residual and Heavy Oil, M. M. Schumacher, Noyes Data Corp., 1980. — www.universityupdates.in
6. Applied Enhanced Oil Recovery, Aural Carcoane, Prentice Hall, 1992.
7. Recent Advances in Enhanced Oil and Gas Recovery, IstvanLaktos, Academy Kiado, 2001.
8. Enhanced Oil Recovery, Don W. Greew, G. Paul Willfite, Society of Petroleum Engineers, 1998.
9. Enhanced Oil Recovery: Field Planning and Development Strategies, Vladmir Alvarado, Eduardo Marriglee, Gulf Professional Publishing, 2010.
10. Modern Chemical Enhanced Oil Recovery: Theory and Practice, Gulf Professional Publishing, 2011.
11. Enhanced Oil Recovery, Teknica, Teknica Petroleum Services Ltd., 2001.

www.universityupdates.in

Outcomes:

- Understand the basic features and technical foundations of the most common EOR methods.
- Apply screening criteria to a given reservoir to select an optimum EOR method both technically and economically.
- Use rock, fluid and reservoir data to specify the process and operating parameters of an EOR method application.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L T/P/D C

www.universityupdates.in

4 -/- 4

(A72721) PETROLEUM REFINERY ENGINEERING

Objectives:

- To understand the various feed stocks of refinery and petroleum products.
- To get acquainted with basic separation and conversion processes used in refining of crude oil.
- To get familiarized with challenges involved in refining from viewpoint of environment.

UNIT-I

Introduction: Overall refinery operations & Indian scenario.

Refinery feed stocks: Crude oil Classification-Composition and properties-Composition of petroleum crude suitable for asphalt manufacture – Crude distillation curves.

UNIT-II

Petroleum Products: Low boiling products – Gasoline – Gasoline specifications – Distillate fuels – Jet and turbine fuels – Automotive diesel fuels; Heating oils –Residual fuel oils; wax and asphalt-Product blending.

Crude distillation: Atmosphere topping unit – Vacuum distillation –Auxiliary equipment – Products of these two units.

UNIT-III

Thermal & catalytic processes: Visbreaking, Hydrovisbreaking, Thermal cracking – Catalytic cracking fluidized bed catalytic cracking and Hydrocracking - Feed stocks – Feed treating – Catalysts process variables – Yield estimation-Latest developments in cracking processes.

Coking: Types of petroleum coke-Properties and uses process description of delayed coking - Flexicoking and fluid coking – Yields.

UNIT-IV

www.universityupdates.in

Hydroprocessing and residue processing: Composition of vacuum tower bottoms – Processing options – Hydroprocessing options – Moving bed hydro processes – Solvent extraction Hydrotreating catalysts – aromatics reduction – Process variables.

Catalytic reforming and isomerization: Catalytic reforming processes – Feed preparation & catalysts – Yields-Isomerization Processes and yields.

UNIT-V

www.universityupdates.in

Alkylation and polymerization: Alkylation feed stocks – Products – Catalysts – Hydrofluoric Acid and sulfuric acid alkylation processes – Comparison of processes – Polymerization processes.

Supporting processes: Hydrogen production and purification – Gas processing unit - Acid gas removal – Sulfur recovery processes – Waste water treatment and control of atmospheric pollution.

TEXT BOOK:

1. Petroleum Refining: Technology and Economics, J.H. Gary and G.E. Handwerk, 4th Edition, Marcel Dekkar, Inc., New York, 2001.

REFERENCES BOOKS:

1. Petroleum Refinery Engineering, W.L.Nelson, 4th Edition, McGraw Hill, New York, 1958.
2. Modern Petroleum Refining processes, 5th Edition, B. K. Bhaskara Rao, Oxford and IBH Publishing Co. Pvt. Ltd., 2008.
3. Petroleum Refining: Grade Oil Petroleum Products, Process Flow Sheets, Jean-Pierre Wauquier, Editions Technip, 1995.
4. Practical Advances in Petroleum Processing, Chang S. Hsu and Paul Robinson, Vol. 1 & 2, Springer, 2006.
5. Thermal and Catalytic Processes in Petroleum Refining, Serge Raseev, Marcel Dekkar, Inc., 2003.
6. Fundamentals of Petroleum Refining, Mohammed A. Fahim, Taher A. Al-Sahhaf, Amal Elkilani, Elsevier Science, 2009.

Outcomes: The student would be in a position to have advanced knowledge of feed-stocks used in the refinery, various conversion processes used to produce various petroleum products.

www.universityupdates.in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72714) HEALTH, SAFETY & ENVIRONMENT IN PETROLEUM INDUSTRY**Objectives:**

- To understand impact of petroleum industry operations on environment.
- To know the importance of safety, health and environment in Petroleum Industry.
- To learn fundamental requirements for the safety, health, and environmental management system

UNIT-I**Introduction to environmental control in the petroleum industry:**

Overview of environmental issues- A new attitude.

Drilling and production operations: Drilling- Production- Air emissions.**UNIT-II**

The impact of drilling and production operations: Measuring toxicity- Hydrocarbons- Salt- Heavy metals- Production chemicals- Drilling fluids- Produced water- Nuclear radiation- Air pollution- Acoustic impacts- Effects of offshore platforms- Risk assessment.

Environmental transport of petroleum wastes: Surface paths- Subsurface paths- Atmospheric paths.

UNIT-III

Planning for environmental protection: Environmental audits- Waste management plans- Waste management actions- Certification of disposal processes- Contingency plans- Employee training.

Waste treatment methods: Treatment of water- Treatment of solids- Treatment of air emissions.

Waste disposal methods: Surface disposal- Subsurface disposal.

Remediation of contaminated sites: Site assessment- Remediation processes.

UNIT-IV

Oil mines regulations: Introduction-Returns, Notices and plans- Inspector, management and duties- Drilling and workover- Production- Transport by pipelines- Protection against gases and fires- Machinery, plants and equipment- General safety provisions- Miscellaneous.

www.universityupdates.inwww.universityupdates.in

UNIT-V

Toxicity, physiological, asphyxiation, respiratory, skin effect of petroleum hydrocarbons and their mixture- Sour gases with their threshold limits- Guidelines for occupational health monitoring in oil and gas industry. Corrosion in petroleum industry- Additives during acidizing, sand control and fracturing.

TEXT BOOKS:

www.universityupdates.in

1. Environmental Control in Petroleum Engineering, John C. Reis, Gulf Publishing Company, 1996.
2. Application of HAZOP and What if Reviews to the Petroleum, Petrochemical and Chemical Process Industries, Dennis P. Nolan, Noyes Publications, 1994.
3. Oil Industry Safety, Directorate (OISD) Guidelines, Ministry of Petroleum & Natural Gas, Government of India and Oil Mines Regulations-1984, Directorate General of Mines Safety, Ministry of Labor and Employment, Government of India.

REFERENCE BOOKS:

1. Guidelines for Process Safety Fundamentals in General Plant Operations Centre for Chemical Process Safety, American Institute of Chemical Engineers, 1995.
2. Guideline for Process Safety Fundamentals in General Plant Operations, Centre for Chemical Process Safety, AIChE, 1995.

Outcome: The student is expected to be able to describe the basic components of safety, health, and environmental systems as defined by the Occupational Safety and Health Administration.

www.universityupdates.in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L T/P/D C

www.universityupdates.in

4 -/- 4

(A72720) PETROLEUM MANAGEMENT, MARKETING AND FINANCE

Objective: The objective of this course is to introduce the student about the nature and function of companies and other organizations involved in technical, financial, commercial and contractual activities in the world-wide upstream oil and gas industries. The nature of mid and downstream oil and gas activities will be briefly examined to set an overall context

UNIT-I

The global oil and gas industry: Oil and gas industry background- Oil and gas reserves- Oil and gas in global economy- The major players- Oil and gas industry value chain- Upstream-mid stream and downstream- Fundamentals of petroleum industry- Industry evaluation and strategies- Nationalism and national oil companies- Role and value of oil and gas- Government and corporate interests- Evolution of national oil companies- Organization of petroleum exporting countries- Political environment related to petroleum industry.

UNIT-II

Access, leasing and exploration: Oil project life cycle- Oil and gas formation- Access and development rights- Historical precedent- The neutral zone concession- Oil leases- Reserves- Defining reserves -Lease auctions exploration and strategy - Partnership and firm-ins.

UNIT-III

Developing oil and gas projects: Project development and project opportunity- Joint development utilization- Project financial analysis- Project execution- Contractor relationships- Problems in project development.

UNIT-IV**Finance and financial performance:**

Business finance- Capital sourcing- Corporate finance- Public equity- Private equity- Venture capital- Debt- Project finance- Multilateral lending- State interest- Oil loans- Ruminations and valuations.

UNIT-Vwww.universityupdates.in**Marketing of crude oil and petroleum products and transportation:**

Crude oil fundamentals- Price of crude- Crude oil prices in transactions- Marketing and sale of motor fuel- Aviations fuel- Lubricants- Asphalt and propane- Transportation- Fundamentals of transportation- Pipelines- Oil tankers- Downstream transportations.

TEXT BOOK:

www.universityupdates.in

1. The Global Oil & Gas Industry: Management, Strategy and Finance, Andrew Inkpen, Michael H. Moffett, PennWell, 2011.

Outcome: The students are expected to be able to evaluate the primary uses of oil and gas and the significance of oil and gas within the global energy industry with the broad technical issues involved in the location and development of oil and gas reserves.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L T/P/D C

4 -/- 4

(A72716) NATURAL GAS PROCESSING**(Elective-I)**www.universityupdates.in**Objectives:**

- To enhance student's knowledge about natural gas produced in the reservoirs, surface handling and processing equipment
- To educate student about knowledge of natural gas, basic chemical properties and physical laws
- To update student with the understanding of operations of separators, heaters and glycol dehydrators.

UNIT-I

Overview of natural gas Industry: Introduction- The world picture for natural gas- Natural Gas in India - Nonconventional gas reserves in India- Sources of natural gas- Natural gas compositions – Classification- Processing and principal products- Product specifications- Combustion characteristics- Overview of gas plant processing- Roles of gas plants - Plant processes.

Field operations and inlet receiving: Field operations- Gas hydrates Inlet receiving- Safety and environmental considerations.

UNIT-II

Gas treating: Introduction- Solvent absorption processes- Physical absorption- Adsorption- Cryogenic fractionation- Membranes- Nonregenerable hydrogen Sulfide scavengers- Biological processes- Safety and environmental considerations.

Gas dehydration: Introduction- Water content of hydrocarbons- Gas dehydration processes - Safety and environmental considerations.

UNIT-III

Hydrocarbon recovery: Introduction- Process components- Recovery processes - Safety and environmental considerations.

Nitrogen rejection: Introduction- Nitrogen rejection for gas upgrading- Nitrogen rejection for enhanced oil recovery- Safety and environmental considerations.

Trace component recovery or removal: Introduction- Helium- Mercury- (BTEX) Benzene, Toluene, Ethylbenzene, and Xylene.

UNIT-IVwww.universityupdates.in

Liquids processing: Introduction- Condensate processing- NGL processing- Safety and environmental considerations.

Sulfur recovery: Introduction- Properties of sulfur- Sulfur recovery - Sulfur storage- Safety and environmental considerations.

Transportation and storage: Introduction-Gas – Liquids.

UNIT-V

Liquefied Natural Gas: Gas treating before liquefaction- Liquefaction cycles- Storage of LNG- Transportation- Regasification and cold utilization of LNG- Economics - Plant efficiency - Safety and environmental considerations.

Text Book:

Fundamental of Natural Gas Processing, Arthur J. Kidnay, William R. Parrish, Taylor and Francis, 2006.

Reference Books:

1. Natural Gas: A Basic Handbook, James G. Speight, Gulf Publishing Company, 2007.
2. Gas Conditioning and Processing, John M. Campbell, Volume 2, 7th Edition, Campbell Petroleum Series, 1992.
3. Gas Conditioning and Processing, Robert N. Maddox, Volume 3, 3rd Edition, Campbell Petroleum Series, 1982.
4. Petroleum & Gas Field Processing, H. K. Abdel – Aal, Mohamed Aggour and M. A. Fahim, Marcel Dekker, Inc., 2003.
5. Engineering Data Book 12th Edition (Electronic), FPS Version, Volume I & II, Gas Processors Suppliers Association (GPSA), 2005.
6. Handbook of Natural Gas Transmission and Processing, Saeid Mokhatab, William A. Poe, James G. Speight, Gulf Professional Publishing, 2006.
7. Surface Production Operations, Ken Arnold, Maurice Stewart, Volume 2, 2nd Edition, Elsevier Science, 1989.
8. Field Handling of Natural Gas, J. Leecraft, 4th Edition, PETEX, 2007.
9. Plant Processing of Natural Gas, Doug Elliot, J.C. Kuo, Pervouz Nasir, 2nd Edition, PETEX, 2012.

Outcomes: The student would be able to describe the basic components of processing equipment and explain various gas plant operational procedures.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E -I Sem

L T/P/D C

www.universityupdates.in

4 -/-/ 4

(A72712) COAL BED METHANE ENGINEERING**(Elective-I)****Objectives:**

- To understand the philosophy of coal bed methane production
- To interpret coal specific tests such as sorption tests, sorption isotherms and well tests
- To evaluate coal bed methane exploration and development opportunities
- To compute gas in the reservoirs and estimate ultimate recovery

UNIT-I

Introduction: Overview of coal bed methane (CBM) in India – CBM vs conventional reservoirs.

Geological influences on coal formation of coals – Coal chemistry – Significance of rank – Cleat system and natural fracturing.

Sorption: Principles of Adsorption-The Isotherm construction-CH₄ retention by coal seams-CH₄ content determination in coal seams-The isotherm for recovery prediction-Model of the micro-pores-coal sorption of other molecular species.

UNIT-II

Reservoir Analysis: Coal as a reservoir-Permeability-Porosity-Gas flow-Reserve analysis-Well spacing and drainage area-Enhanced recovery.

Well Construction: Drilling-Cementing.

Completions: Open hole completions-Open hole cavitation process, Cased hole completions- Multi zone entry in cased hole.

UNIT-III

Formation Evaluations, Logging: Borehole environment-Tool measurement response in coal-wire line log evaluation of CBM wells-Gas-In-Place calculations-Recovery factor-Drainage area calculations-Coal permeability/Cleating-Natural fracturing and stress orientation-Mechanical rock properties in CBM evaluation.

www.universityupdates.in**UNIT-IV**

Hydraulic fracturing of coal seams: Need for fracturing coals-Unique problems in fracturing coals-Types of fracturing fluids for coal-In situ conditions-Visual observation of fractures.

UNIT-V

Water production and disposal: Water production rates from methane wells-
Chemical content-Environmental regulations-Water disposal techniques-
Economics of coal bed methane recovery.

TEXT BOOKS:

www.universityupdates.in

1. Coal Bed Methane: Principles and Practice, R. E. Rogers, 3rd Edition, Prentice Hall, 1994.
2. Coal Bed Methane [CD – ROM], Robert A. Lamarre, American Association of Petroleum Geologists, 2008.

REFERENCE BOOKS:

1. Fundamentals of Coal Bed Methane Reservoir Engineering, John Seidle, Pennwell Corp., 2011.
2. Coal Bed Methane, Society of Petroleum, 1992.
3. A Guide to Coal Bed Methane Operations, B. A. Hollub, Society of Petroleum, 1992.

Outcomes: The student would be in a position to have knowledge of interpreting various techniques involved in enhancing the recovery of coal bed methane.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72719) PETROCHEMICAL ENGINEERING**(Elective -I)**www.universityupdates.in**Objective:** The course is designed to

- Impart knowledge to the students about the latest developments in petrochemical engineering.
- To understand the various feed stocks of petro-chemical and its products.
- To get acquainted with basic manufacturing processes of various petro-chemical products.

UNIT-I

Introduction: Petrochemical industry-Structures of petrochemical complexes-Feedstock for petrochemicals-Profile of petrochemicals and their end products-Indian Petrochemical Industries-Profile of Indian petroleum and petrochemical Industry.

UNIT-II

Petrochemical Feed stocks: Naphtha cracking-Gas cracking and Gas reforming.

Chemicals from gas reforming: Methanol- Acetic acid- Ammonia and urea. Production of ethylene & propylene: Separation of cracking products- Emerging technologies.

UNIT-III

Chemicals from C and C olefins: Ethylene oxide- MEG- Ethyl benzene- styrene. Acrylonitrile-butyr aldehydes and butanols, 2-ethyl hexanol.

Polymers based on olefins: LDPE, HDPE & LLDPE and Polypropylene- and polystyrene.

C based Chemicals and others: Butadiene-1-Butene-n-Butenes- Isobutylene-n-Butene-Octenes-1,4-Butanediol-Chloroprene-Isoprene- Maleic anhydride.

www.universityupdates.in**UNIT-IV**

Aromatic production: Petroleum feedstock for aromatic hydrocarbons-Aromatic hydrocarbon production- catalytic reforming-Reactions in catalytic reforming-Reforming catalyst-Reforming process-Process variables in catalytic reforming-Pyrolysis gasoline as aromatics feedstock-Aromatic separation from reformate and pyrolysis gasoline- Emerging technologies for the production of BTX.

UNIT-V

Production of Chemicals based on aromatics: Phthalic anhydride–Linear alkyl benzene–Phenol– Nitrobenzene and aniline

Chemicals for Fibres: Cyclohexane– Caprolactam – Adipic acid – Adiponitrile–Hexamethylene diamene and Dimethyl terephthalate, Terephthalic acid –Polyester fibre (Polyethylene terephthalate)–Nylon 66– Nylon 6– Acrylic fibres.

TEXT BOOK:

1. Petrochemical Process Technology, ID Mall, Macmillan India Ltd., New Delhi. 2007.

REFERENCE BOOKS:

1. Chemistry of Petrochemical Processes, Sami Matar and Lewis F.Hatch, 2nd Edition, Gulf Publishing Company, Houston, 2000.
2. Fundamentals of Petroleum Chemical Technology, P Belov, Mir Publishers, 1970.
3. Petrochemical Processes, A. Chauvel and G.Lefebvre, Volume 1 & 2, Gulf Publishing Company, 1989.
4. Petrochemical Production Processes, N.Naderpour, SBS Publishers, 2009.
5. Petrochemicals, B. K. Bhaskara Rao, Oxford & IBH Publishing, 2002.

Outcome:

The student would be in a position to have a knowledge of feed-stocks used in the petro-chemical engineering, various techniques used to produce various petrochemical products.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72325) MASS TRANSFER OPERATIONS**(Elective-I)**www.universityupdates.in**UNIT-I**

The Mass Transfer Operations: Classification of the Mass-Transfer Operations, Choice of Separation Method, Methods of Conducting the Mass-Transfer Operations, Design Principles, Molecular Diffusion In Fluids: Molecular Diffusion, Equation of Continuity, binary solutions, Steady State Molecular Diffusion in Fluids at Rest and in Laminar Flow, estimation of diffusivity of gases and liquids.

Diffusion in Solids, Fick's Diffusion, Unsteady State Diffusion, Types of Solid Diffusion, diffusion through polymers, diffusion through crystalline solids, Diffusion through porous solids & hydrodynamic flow of gases.

UNIT-II

Mass Transfer Coefficients: Mass Transfer Coefficients, Mass Transfer Coefficients in Laminar Flow (Explanation of equations only and no derivation), Mass Transfer Coefficients in Turbulent Flow, eddy diffusion, Film Theory, Penetration theory, Surface-renewal Theory, Combination Film-Surface-renewal theory, Surface-Stretch Theory, turbulent flow in circular pipes, Mass transfer data for simple situations.

Inter phase Mass Transfer: Concept of Equilibrium, Diffusion between Phases, Material Balances in steady state co-current and counter current stage processes, Stages, Cascades.

UNIT-III

Distillation, absorption and stripping: Introduction- The basics of distillation- Theoretical trays, real contacting equipment- Distilling complex mixtures- Calculation methods for distillation columns- Designing a distillation separation unit-Absorption, stripping-Extractive and azeotropic distillation- Reactive distillation.

Distillation, absorption and stripping in the petroleum industry:

Atmospheric distillation of crude oil- Vacuum distillation of the atmospheric residue- Gasoline distillation and gas fractionation- Column internals for distillation, absorption and stripping.

www.universityupdates.in**UNIT-IV**

Liquid-liquid extraction: Introduction- Conventions and notations- Onestage extraction- Crosscurrent extraction- Single countercurrent extraction- Countercurrent extraction with reflux- Dual solvent extraction- Solvent

characteristics.

Solvent extraction in the oil industry: Eliminating aromatic compounds from lube oil stocks to produce lubricants- Deasphalting- Aromatics extraction from light oil cuts- Liquid-liquid extraction equipment.

UNIT-V.

www.universityupdates.in

Solid –Liquid Operations: Nature of adsorbents, Adsorption: Physical adsorption, Chemisorption, Adsorption hysteresis, Adsorption isotherm, Single stage operation, Fixed bed adsorption, fluidized bed, pressure and thermal swing adsorption.

Introduction to membrane separations: RO, UF, NF, MF, GS, Dialysis, electro dialysis, pervaporation, driving forces, equipments, concentration polarization (qualitative treatments only).

TEXT BOOK

1. Mass Transfer Operations, 3rd ed., R. E. Treybal, McGraw-Hill, New York, 1980.
2. Membrane Separations, M.H.V. Mulder, Springer Publications, 2007

REFERENCE:

1. Transport Processes and Separation Process Principles 4th ed., C. J. Geankoplis, PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Fundamentals of Momentum, Heat and Mass Transfer, 3rd ed., J.R. Welty, C.E. Wicks and R.E. Wilson, John Wiley & Sons, New York, 1984.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A71819) MATERIAL SCIENCE**(Elective-I)****Unit-I**

Introduction: Classification of Engineering materials, Structure-Property relationships in materials.

Crystal Geometry and Structure Determination: Space lattice and Unit cell. Bravais lattices, crystal systems with examples. Miller indices for directions and planes. Packing efficiency, ligancy and coordination number; structure determination by X-ray diffraction and powder methods.

Structure of Solids: The crystalline and non crystalline solids: Bonds in solids. Allotropy in metals.

www.universityupdates.in

Unit-II

Imperfection in solids: Point defects, line defects Dislocations -edge and screw dislocation-Burgers circuit and Burgers vectors, dislocation reaction, dislocation motion, multiplication of dislocations, role of dislocation on crystal properties; surface defects; dislocation density and stress required to move dislocations. On dislocation motion, the effect of precipitate particles on dislocation motion. Effect of solute atoms.

Elastic, Anelastic and visco elastic behavior; Elastic Behavior: Atomic model of elastic behavior, the modulus as a parameter in design, rubber like elasticity, Relaxation processes-Spring -dashpot models.

Unit-III

Phase diagrams: Phase rule, single component system, binary phase diagrams, microstructural changes during cooling. The lever rule, some typical phase diagrams like Cu-Ni, Al-Si and Fe-C and applications of phase diagrams.

Heat treatment: Annealing, Normalizing, hardening and Tempering, Hardenability of steels, Age hardening.

www.universityupdates.in

Unit-IV

Plastic deformation tensile test, stress-strain curve, Plastic deformation by slip, the shear strength of perfect and real crystals, work hardening and dynamic recovery.

Creep: Creep curve, Mechanisms of creep, Factors affecting the creep, creep resistant materials

Fatigue: S-N curve, fatigue cycles, factors affecting the fatigue properties.

www.universityupdates.in

Unit-V

Ceramics, polymers and composites: Crystalline ceramics, glasses, cermets: structure, properties and applications.

Classification, properties and applications of composites.

Classification, properties and applications of polymers.

TEXT BOOK:

1. Materials Science and Engineering; by D.R.Askeland, Pradeep P.Fuley and D.K.Bhattacharya, Cengage learning.
2. Materials Science and Engineering by Kodgire.

REFERENCE:

1. Introduction to physical Metallurgy by S.H.Avner.
2. Elements of Materials Science by V.Raghavan
3. Materials Science and Engineering by William and Collister.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72717) OFFSHORE ENGINEERING

(Elective-II)

Objective: This course covers general introduction to explain the essential features of core activities, Project Overview, Codes and Standards practice, Installations and Vessels, offshore structures.

www.universityupdates.in

UNIT-I

Overview of offshore structures: Introduction- Deepwater challenges- Functions of offshore structures- Offshore structure configurations- Bottom-Supported fixed structures- Compliant structures- Floating structures- Classification societies and industry standard groups.

Novel and small field offshore structures: Introduction- Overview of oil and gas field developments- Technical basis for developing novel offshore structures- Other considerations for developing novel offshore structures- Novel field development systems- Future field development options.

UNIT-II

Ocean environment: Introduction- Ocean water properties- Wave theory- Breaking waves- Internal waves- Sea spectrum- Sea states- Wave-driven current- Loop current- wind and wind spectrum- Offshore environment by location.

Loads and responses: Introduction- Gravity loads- Hydrostatic loads- Resistance loads- Current loads on structures- Steady and dynamic wind loads on structures- Wave loads on structures- Applicability of Morison force vs Diffraction force- Steady wave drift force- Slow-Drift wave forces- Varying wind load- Impulse loads- Response of structure- Applicability of response formula.

www.universityupdates.in

UNIT-III

Fixed offshore platform design: Field development and concept selection activities- Basic and detailed design of a fixed jacket-Tower-type offshore platform- Special topics.

Floating offshore platform design: Introduction- Floating platform types- Design of floaters- Floating production storage and offloading systems.

UNIT-IV

Semi submersibles- Tension leg platforms- Spar design- Hull structure- Construction and installation.

Fundamental aspects of the design of FPSO.

www.universityupdates.in

UNIT-V

Drilling and production risers: Introduction- Drilling risers- Production risers- Vortex induced vibration of risers- VIV suppression devices- Riser clashing- Fatigue Analysis.

TEXT BOOK:

www.universityupdates.in

1. Handbook of Offshore Engineering, S. Chakrabarti, Volume 1 & 2, Elsevier, 2005.

Outcomes: The students would acquire knowledge for designing offshore structures. They shall also understand, how the physical environment affects such designs and how the structures respond to the environmental actions.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72715) HORIZONTAL WELL TECHNOLOGY

(Elective-II)

www.universityupdates.in

Objectives: This course is designed to provide the broad background, necessary to understand and successfully apply the technology of horizontal wells at various elevations. The course provides various methods for predicting well performance based on expected production rate, drainage area, and fluid coning.

UNIT-I

Overview of horizontal well technology: Introduction- Limitations of horizontal wells- Horizontal well applications- Drilling techniques- Horizontal well length based upon drilling techniques and drainage area limitations- Completion techniques.

Reservoir engineering concepts: Skin factor- Skin damage for horizontal wells- Effective wellbore radius r' - Productivity index, f - Flow regimes- Influence of areal anisotropy.

UNIT-II

Steady-state solutions: Steady-state productivity of horizontal wells- Effective wellbore radius of a horizontal well- Productivity of slant wells- Comparison of slant well and horizontal well productivities- Formation damage in horizontal wells- Field histories.

Influence of well eccentricity: Introduction- Influence of well eccentricity- Drilling several wells- Horizontal wells at different elevations.

UNIT-III

Transient well testing: Introduction-Mathematical solutions and their practical implications- Generalized flow regimes- Pressure response- Detailed well testing flow regimes- Pressure directivities- Wellbore storage effects- Practical Considerations.

UNIT-IV

Pseudo-steady state flow: Shape factors of horizontal wells- Horizontal well pseudo-steady state productivity calculations- Inflow performance of partially open horizontal wells- Inflow performance relationship (IPR) for horizontal wells in solution gas-drive reservoirs- Predicting horizontal well performance in solution gas-drive reservoirs.

UNIT-V

Water and gas coning in horizontal wells: Critical rate definition- Water

and gas coning in horizontal wells- Horizontal well breakthrough time in a bottom- Water drive reservoir- Breakthrough time for a horizontal well in a reservoir with gas cap or bottom water- Cone breakthrough time for horizontal wells in reservoir with both gas cap and bottom water- Critical rate for horizontal well in edge-water drive reservoir practical considerations- Field Histories.

TEXT BOOK:

www.universityupdates.in

1. Horizontal Well Technology, S. D. Joshi, PennWell Publishing Company, 1991.

REFERENCE BOOK:

1. Horizontal Wells: Formation Evaluation, Drilling and Production Including Heavy Oil Recovery, Roberto Aguilera, G. M. Cordell, G. W. Nicholl, J. S. Artindete, M. G. Nq., Gulf Publishing Co., 1991.

Outcome: The student would be able to understand recent well construction technologies and the reservoir characteristics required for designing horizontal wells and would study specialized drilling strategies like horizontal ones.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L	T/P/D	C
4	-/-	4

(A72718) OPTIMIZATION OF UPSTREAM PROCESSES

(Elective II)

www.universityupdates.in

Objective:

- To develop understanding of the principles, techniques, standard tools of production optimization
- To formulate multi-objective optimization problem with constraints based on production requirements
- To gain exposure to application of optimization techniques for performance in case of multi-phase flow and also in case of wells per productivity perspective.

UNIT-I

Introduction: Production systems modeling and optimization – overview

Production system modeling: Production system – System Modeling – Nodal Analysis

Optimization objective and Constraints:

Economics Objectives- Environmental Objectives – Technical Objectives – Constraints

UNIT-II

Properties of Reservoir Fluids: Fluid Properties- Pressure Temperature Phase Diagram- Equation of State – Oil models

Single Phase Flow in Wells and Pipelines: Governing Equations – Pressure Drop Analysis

www.universityupdates.in

UNIT-III

Multi Phase Flow in Wells, Pipelines and Chokes: Flow Regimes – Slip and Hold-Up- Gradient Curves – Intake Pressure Curves for Describing Performance –Multi Phase flow through Chokes

Inflow Performance: Then importance of Inflow Performance-Governing Equations – Inflow Performance Relationship –Formation Damage and Skin –Multi Layer Inflow Performance.

UNIT-IV

Oil Well Productivity: Optimizing well Productivity- Oil Completions- Production Rate of a Vertical Well Operating at given Tubing Head Pressure- Production Rate of Vertical Well Operating through a Surface Choice- Summary of Analysis Methods.

www.universityupdates.in

UNIT-V

Field Development: Planning and Field Management- Short Term Optimization of Well Performance – Long Term Optimization of Well Performance – Productivity of Horizontal Wells

TEXTBOOK:

1. Modelling and Optimization of Oil and Gas Production Systems, JD Jansen & PK Currie, TU DELFT, 2004

REFERENCE:

1. Production Optimization using Nodal Analysis, Beggs H.D., Oil and Gas Consultants International Publications, Tulsa 1991

Outcome: The student would be equipped with the advance knowledge of various optimization techniques to be used in Petroleum Industry to enhance the production considering various constraints.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L T/P/D C

www.universityupdates.in

4 -/-/ 4

(A80808) CHEMICAL REACTION ENGINEERING – I

(Elective-II)

Objective: To provide a foundation on deriving rate expressions for series, parallel, reversible reactions and the knowledge about product distribution in multiple reactions, recycle reactors and auto catalytic reactions.

UNIT I

Overview of chemical reaction engineering- classification of reactions, variables affecting the rate of reaction definition of reaction rate. Kinetics of homogenous reactions- concentration dependent term of rate equation, Temperature dependent term of rate equation, searching for a mechanism, predictability of reaction rate from theory.

Interpretation of batch reactor data- constant volume batch reactor:- Analysis of total pressure data obtained in a constant-volume system, the conversion, Integral method of analysis of data- general procedure, irreversible unimolecular type first order reactions, irreversible bimolecular type second order reactions, irreversible trimolecular type third order reactions, empirical reactions of nth order, zero-order reactions, overall order of irreversible reactions from the half-life, fractional life method, irreversible reactions in parallel, homogenous catalyzed reactions, autocatalytic reactions, irreversible reactions in series.

UNIT II

Constant volume batch reactor- first order reversible reactions, second order reversible reactions, reversible reactions in general, reactions of shifting order, Differential method of analysis of data. Varying volume batch reactor- differential method of analysis, integral method of analysis, zero order, first order, second order, nth order reactions, temperature and reaction rate, the search for a rate equation.

www.universityupdates.in

UNIT III

Introduction to reactor design- general discussion, symbols and relationship between C and X. Ideal reactors for a single reaction- Ideal batch reactor, Steady-state mixed flow reactor, Steady-state plug reactors.

Design for single reactions- Size comparison of single reactors, Multiple-reactor systems, Recycle reactor, Autocatalytic reactions.

UNIT IV

Design for parallel reactions- introduction to multiple reactions, qualitative discussion about product distribution, quantitative treatment of product

distribution and of reactor size.

Multiple reactions-Irreversible first order reactions in series, quantitative discussion about product distribution, quantitative treatment, plug flow or batch reactor, quantitative treatment, mixed flow reactor, first-order followed by zero-order reaction, zero order followed by first order reaction.

UNIT V

Temperature and Pressure effects- single reactions- heats of reaction from thermodynamics, heats of reaction and temperature, equilibrium constants from thermodynamics, equilibrium conversion, general graphical design procedure, optimum temperature progression, heat effects, adiabatic operations, non adiabatic operations, comments and extensions. Exothermic reactions in mixed flow reactors-A special problem, multiple reactions.

TEXT BOOK:

1. Chemical Reaction Engineering, 3rd ed., O. Levenspiel, John Wiley & Sons, 1999.

REFERENCES:

www.universityupdates.in

1. Elements of Chemical Reaction Engineering, 2nd ed., H.S. Fogler, PHI Learning Pvt. Ltd., New Delhi, 2010.
2. Chemical Engineering Kinetics, 3rd ed., J.M. Smith, McGraw-Hill, New York, 1981.

Outcome: This course provides necessary knowledge for selection of the chemical reactors for a particular process, design and simulation of existing reactor.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**IV Year B.Tech. P.E.-I Sem**

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

**(A72786) OIL & GAS PROCESSING EQUIPMENT DESIGN
& SIMULATION LAB**

The following experiments have to be conducted using C/C++/ Simulink using MATLAB/Hysys:

1. Oil- Water separator.
2. Gas- Oil-Water separator.
3. Lean / rich amine heat exchanger.
4. Air cooled heat exchanger.
5. CO₂ and H₂S absorber unit using, MEA/DEA amine solution.
6. Stripping unit.
7. Single stage flash vaporization unit.
8. Three stage flash vaporization unit.
9. Liquid pumping system.
10. Gas Compressor unit.

www.universityupdates.in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. P.E.-I Sem

L T/P/D C

www.universityupdates.in

- /3/- 2

(A72787) PETROLEUM PRODUCT TESTING LAB

1. Determination of Distillation characteristics of crude oil & its products.
2. Determination of Reid vapor pressure of crude oil & gasoline.
3. Determination of Viscosity of diesel and transformer oils.
4. Determination of Smoke point of kerosene.
5. Determination of Carbon residue of petroleum oils.
6. Determination of Flash & Fire points of gasoline, kerosene and other products.
7. Estimation of Water content in petroleum products.
8. Estimation of calorific value of LPG/gasoline.
9. Determination of Aniline point of gasoline and diesel oil.
10. Determination of Softening point of bitumen.
11. Determination of Cloud & Pour points of petroleum products.
12. Detection of Corrosiveness of petroleum products.