Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. V Semester

Petroleum Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

5PE3-01: Natural Gas Engineering
(Common with Chemical/ Petrochemical Engineering 5CH5-11/5PC5-11)

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Properties and Measurement of Natural Gas:** Origin of natural gas, other sources of gaseous fluids. Phase behavior fundamentals, qualitative and quantitative phase behavior, vapor liquid equilibrium. **Equation of state:** critical pressure and temperature determination. Gas compressibility, viscosity and thermal conductivity, formation volume factor	5
3	**Gas Reservoir Performance and Gas flow measurement:** Fundamentals of gas flow in conduits, fundamentals of fluid flow in porous media, inflow performance curves, outflow performance. **Gas flow measurement:** Methods of measurements, Orifice meters equation, turbine meters.	6
4	**Flow of Gas in Production Tubing:** Introduction, gas flow fundamentals, vertical and inclined single phase flow of gas, Calculating flow and static bottom hole pressure, Gas flow through restrictions. Temperatures profiling in flowing gas systems. **Natural gas Processing:** Gas liquid separations, dehydration processes, absorption and adsorption by gas permeation. **Desulfurization processes**: solid bed sweetening process, physical and chemical absorption processes, Acid gas removal. Integrating natural gas processing.	8
5	**Gas Compression**: Introduction, types of compressors, Selection, Thermodynamics of compressors, Design fundamentals for reciprocating, centrifugal and rotary compressors (single and multistage). Gas Gathering and Transport Gas gathering system, steady state flow in simple pipeline system, steady state and non steady state flow in pipelines, solution for transient flow. Installation, operation and trouble shooting of natural gas pipelines5	8
	Total	28

5PE4-02: Drilling Technology-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Directional Drilling**: Types of deflection tools, tool orientation, Directional well profiles, Well path deflection & correction. **Down Hole Motors** : Positive displacement motors and Turbo-drills – motor description, Power calculation and applications	10
3	**Horizontal Well Drilling**: Horizontal well objectives and selection, Different profiles, Drilling techniques. **Down the Hole Well Surveying**: Well surveying objectives, Surveying methods, Surveying Analysis.	10
4	**Measurements While Drilling**: Objectives of MWD/ LWD, MWD tools, Telemetry system and data interpretation.	9
5	**Special Methods of Drilling** : Aerated drilling, Under-Balanced drilling, Overbalanced drilling, HPHT Drilling, Plasma drilling, Top drive drilling, Re-entry drilling, Jet Drilling, Extended reach drilling, Multilateral drilling, Slim hole drilling, coil tubing drilling.	10
	Total	40

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5PE4-03: Petroleum Production Engineering-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Oil Surface Production Facilities**: Gathering and collection of oil and gas: GGS, CTF and GCS - layout, sequential treatment, and safety features.	9
3	**Field Processing of Oil & Gas:** Flash and stage separation of oil & gas, oil & gas. Design of Oil & Gas separators. Demulsification, dehydration, stabilisation and desalting of crude oil. Dehydration and desalting of gas.	10
4	**Storage of Petroleum and Petroleum Products**: Types of storage system, Design of storage tanks as per API and ASTM codes, **Metering and Measurements**: Metering of oil & gas, Orifice and other metering devices and systems. Multiphase flowmeter. Sampling and Testing of crude oil. Water and sediment determination.	10
5	**Work Over-** Workover Rigs: Types & selection, Workover & Completion Fluids. **Well Stimulation** - Type & description of stimulation techniques, Design of matrix acidization and acid fracturing. Design of hydraulic fracturing	10
	Total	40

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5PE4-04: Well Logging Technology

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Well logging Technique:** Introduction of well logging**.** Subsurface Petro-physical measurements,Role of well logging in formation evaluation. Borehole environments & resistivity profile.	9
3	**Wireline logging Methods:** SP and Resistivity logs (focused resistivity, Lateral logs, MSFL, Induction log), Radioactive logs, and acoustic logs (principles, types of tools and applications). Evaluation of CBL/ VDL, USIT, SFT, RFT.	10
4	**Production Logging**: Introduction, type of tools, principles, limitations and applications. **Special Type of Logging Tools:** Casing inspection tools (principles, application and limitation), Formation micro scanner (FMS), DSI, NMR logging principles. Logging in high-angle wells	10
5	**Log Interpretation and Analysis Techniques.** Standard log interpretation methods. Cross-plotting methods: neutron-density, sonic-density and sonic-neutron etc. Clean sand interpretation. Concepts of invasion – RXO, Tornado charts. Shaly sand interpretation.	10
	Total	40

5PE4-05: Reservoir Engineering-II

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Relative permeability**: Fractional flow. Well performance – inflow performance, tubing performance. **Material balance equation**: Generalized Oil & Gas MBE and its modifications, applications.	9
3	**Reservoir drive mechanism**: Water drive, partial water drive, depletion drive, gas cap drive, gas expansion, solution gas, rock drive, gravity drainage, combination. Decline curves for drive types, predicting reservoir drive mechanism, Drive Mechanism and recovery factors, production behaviour of oil & gas reservoirs, Performance prediction of depletion drive, gas cap drive, water drive and combination drive	10
4	**Water influx** : Classification of aquifers, steady and unsteady state water influx models, Reservoir pressure maintenance techniques, their advantages and limitations **Well performance:** Vertical and horizontal oil wells, Vertical and horizontal gas wells	10
5	**Gas and water coning:** Coning in vertical wells, breakthrough time and after breakthrough performance, coning in horizontal wells, breakthrough time **Reservoir Management**: Reservoir management process, reservoir management team, downhole monitoring and acquisition, management of continuous data stream, integration of data to subsurface model, immersive visualization systems, intelligent completions, rigless intervention, improved performance through field life. Benefits of reservoir management – case examples.	10
	Total	40

5PE5-11: Unit Operations in Petroleum Industry

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Conduction:** Introduction to unit operation and its application in petroleumengineering. Heat Transfer and its application, Modes of heat transferone dimensional and two dimensional, heat rate equations, Theory of insulation, critical radius calculations, types of insulationmaterial, conduction through slab, cylinder and sphere.	6
3	**Convection:** Convective heat transfer, natural and forced convection, co/counter/cross current contacting for heat transfer, individual and overall heat transfer coefficient, Fouling factor, Heat transfer with and without phase change conditions**.**	6
4	**Heat Exchange equipment:** Introduction to double pipe, shell and tube exchangers, condensers, extended surface equipment. **Evaporation-** Type of evaporators and their applications single and multiple effect evaporators, operation of forward– backward and mixed feed operations,	7
5	**Mass transfer and its application:** Analogies in transfer process, basic concept of diffusion and interphase mass transfer. Mass transfer theory film theory Penetration and surface renewal theory **Distillation:** Rectification, reflux ratio, calculation of numbers of plates by McCabe Thiele method, optimum reflux ratio Basic introduction to absorption, liquid liquid extraction, leaching **Drying:** Equilibrium mechanism theory of drying, drying rate curve. Introduction to filtration Sedimentation and settling.	8
	Total	28

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5PE5-12: Drilling System Design

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Drilling Rig Selection and Design**: Environmental loading and stability of rig. Design of Blockand Tackle System, Design of Draw works Drum,Top drive drilling.	7
3	**Casing Design**: Conventional and conditional Casing Design Practices, Deep well strings, **Design practices for high inclined, Horizontal and Slanted wells**:Liner design and setting, Casing Buckling and Well Head Loads: Casing landing practices, Buckling criteria and Calculation of well head loads.Casing while drilling**.**	8
4	**Drill String Design**. **Mud Hydraulics Design**: Rheology of drilling fluids and compatibility to borehole conditions, Hydraulic horse power and Rig horse power calculations. Jet impact force, Hydraulics design in High inclines wells. Bit Hydraulics, Bottom drive hydraulics design.	6
5	**Rotary System Design**: Design and performance of Kelly drive, Bottom Drive and Top Drive Systems.	6
	Total	28

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5PE5-13: Transportation of Petroleum Products

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basics of Pipeline construction**: operation and protection. Pump and compressor	7
3	**Instrumentation and Control**: Metering and measurements of oil and gas. Traffic management, Fire and safety rules. Indian and Global supply scenario of petroleum and petroleum products	8
4	Product quality control. Bulk distribution and handling-domestic, commercial and industrial. Storage of petroleum products in fixed installations. Standards and regulations.	6
5	Role of International oil companies and OPEC pricing mechanism. Administered and market determined, pricing mechanism in India. **Conservation of petroleum & its products**. Spot and other market control mechanism.	6
	Total	28

5PE4-21: Heat Transfer Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P **End Term Exam: 3 Hours**

List of Experiment

1. To Measure the thermal Conductivity of Liquid and solid.
2. To measure the thermal conductivity of liquid and solid (linear model).
3. To measure the transfer conductivity measurements in linear and radial method.
4. To Measure the Emissivity of the Test plate Surface.
5. To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
6. To Determine the Surface Heat Transfer Coefficient for Heated Vertical Cylinder in Natural Convection.
7. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
8. To Study Performance of Simple Heat Pipes
9. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
10. To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.
11. Testing and performance of different heat insulators.
12. To understand the importance and validity of Engineering assumptions through the lumped heat capacity method.

5PE4-22: Petroleum Production Engineering Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

List of Experiment

1. Measuring the density.
2. Measuring the specific gravity and API gravity.
3. Measuring the viscosity using Brookfield Viscometer
4. Measuring the viscosity using U – tube Viscometer
5. Determination of the water in crude oil by distillation
6. Determination of the water in crude oil by the centrifuge.
7. Determination of the total salts content of crude oil by conductivity method.
8. Determination of natural gas composition using GC chromatography

5PE4-23: Reservoir Characterization Sessional

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

Study related to the following

1Special Core Analyses (degree of moisture, capillary pressure, electrical abilities and relative permeability)

2 Petrophysical measurements (capillary pressure curves, resistivity measurements and compressibility)

3.Core and plug preparation: Introduction to the machines for the various steps of core preparation including core slabbing, core plugging and trimming

4. Cleaning and saturation determination. The available instruments for core cleaning as well as saturation determination will be introduced. This includes extraction/distillation method core cleaning (Dean Stark), drying and heating for saturation determination (Retort Oven)

5. Resistivity. Introduction for the rock conductivity measurements at surface for pressure and at overburden pressure.

6. Surface and interfacial tension. An introduction to various methods of measurements.

7. Capillary pressure. Introduction to capillary measurement methods under drainage and imbibition.

5PE7-30: Industrial Training

Credit: 2.5 **Max. Marks: 125(IA:75, ETE:50)**

Student had undergo mandatory 45 days in-house/industrial training after IV semester. Training Examination will be held in V Semester.

5PE8-00: Social Outreach, Discipline & Extra Curricular Activities (SODECA)

Credit: 0.5 **Max. Marks:25**

Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Petroleum Engineering

Rajasthan Technical University, Kota

Effective from session: 2019 – 2020

6PE3-01: Health Safety & Environment
(Common with Petrochemical Engineering 6PC5-11)

Credit: 2 **Max. Marks: 100(IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Importance of Safety** Industrial safety and loss trends, safety and environmental concerns, development of industrial safety and loss prevention approaches – loss prevention. Total loss control, quality assurance, total quality management, concept of hazard system. The characterization of hazards, hazard sources and their realization. **Safety Hazards** Major process hazards: self-heating, flame propagation, limits of flammability, explosion, detonation and deflagration, toxic materials. Dosage, acute and chronic effects, threshold limits, fire, explosion and toxic release, effects of hazards	5
3	**Building a Safe Environment** Parameters determining probability and consequence of hazards, occupational health and hygiene, personal safety methods, work permit, material safety data sheet. **Hazard identification**: use of hazard indices, hazard and operability studies **Hazard Control:** Major hazard control, legislation and laws, case studies of major hazardevents..	6
4	**Impact on Air** Air pollution: major pollutants, meteorology, lapse rate, dispersion, engineering control of air pollution. Safety aspects of H2S leakage from oil and gas fields. Air pollution causes, remedies in fertilizer plants, petrochemical plants etc. **Impact on Water** Water pollution: physical, chemical and biological water quality parameters, pollution by oil spills. Ground water pollution near oil dispensing stations.	8
5	**Pollution Control** Remediation of the environment, engineered systems for water purification, sludge treatment and disposal. Water pollution causes and remedies in oil production sites, refiners and in production of petrochemicals,	8
	Total	28

6PE4-02: Artificial Lift Techniques

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Principles and descriptions of Artificial lift methods:**Inflow performance ,Gaslift -continuous and intermittent; Chamber lift, Electrical submersible pumping, Sucker rod pumping; Progressive cavity pump; Plunger lift; Hydraulic pump – piston & jet type	7
3	**Gas lift design:** Continuous Gas Lift, Intermittent Gas Lift, Type of Installations, Gas Lift valve Mechanics, other common valve types, selection of Gas Lift valve, Reverse flow check valve, merits and demerits of different categories of gas lift valves, Plunger lift operation	12
4	**Sucker Rod pump Design:** Sucker rod pumping system, pumping units, sub-surface pump, sucker rod string, gas and tubing anchors, skinner bar. Well Head Equipment .Selection of SRP installations.	10
5	**Electric Submersible pumping**: Centrifugal electric submersible pumping system (ESP), Application, surface components, standard performance curves, Total Dynamic Head. Recent advances in Electrical Submersible Pumping.	10
	Total	40

6PE4-03: Well Test Analysis

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Principles of Fluid Flow** Principles of Fluid Flow for steady state, semi steady state & non steady state conditions. Steady State Flow Tests (Indicator Diagram) and Gas Well Tests, Diffusivity Equation. Derivation & Constant Terminal RateSolution	7
3	**Pressure Transient Tests:** Analysis and Pressure Draw-downTests, Pressure buildup test, Reservoir limit test (RLT etc. Multiple well testing, Wireline formation testing. Wireline while drilling formation Testing, Interference testing, Pulse testing, Multirate testing	12
4	**Well-test analysis by use of type curves:** Fundamentals of type curves, Ramey's typecurve, McKinley's and Gringarten et al type curves.	10
5	**Gas well testing:** Basic theory of gas flow in reservoir, Flow-after-flow test, Isochronal test	10
	Total	40

6PE4-04: Offshore Drilling & Production Operations

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Physical Environment** Overview of physical ocean environment, geotechnical aspect - seafloor marine soils, composition and properties of sea water,seawater corrosion, offshore rigs, floating drilling vessels**.**Wind, wave, current and other forces acting on offshore structures	7
3	**Field Operations**: Station keeping, conventional mooring system,spread mooring system, design considerations, operations,equipment and functions, Dynamic positioning system:components, working. Floater well control, shut in procedures, well kill operations, subsea well head, BOP Stack.	12
4	**Deepwater Drilling**: Deepwater well construction problems and solutions, deepwater cementation, high temp- high pressure wells, casing and mud policy. Drilling logs, gas hydrate problems. Deepwater drilling operations, **Riser system**: components, riser tensioners, heave compensator, emergency disconnect and hang off. Wellbore stability and rock mechanics, mud window for vertical, horizontal deep water drilling. ROV	10
5	**Offshore structures**: Fixed steel structures, Concrete Gravity Base Structures, TLPs, Semi -submersible and Floating Production systems, SPM, SPAR Application. Depths and design limitations. Installation of offshore platforms, Typical Platform Layout, Process flow diagram, Static and Rotary Equipment. Safety systems. deepwater completion, Subsea completion, planning production monitoring and control system.	10
	Total	40

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6PE4-05: Geophysical Exploration Techniques

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Gravity Method:** Gravity survey, Gravity anomalies, data reduction. Regional and residual anomalies separation, Interpretation of anomalies map and application in hydrocarbon exploration. **Magnetic Method**: Basic concepts and definitions. Elements of Earth's magnetic field, Field procedure, data reduction, aeromagnetic surveys. Interpretation of magnetic anomaly map and its application	8
3	**Seismic Methods:** Seismic Waves: Body and surface waves; velocity and attenuation, reflection, refraction and diffraction.Seismic energy sources & detectors**.** Refraction methods: Geometry of refracted ray path, Horizontal beds (two layer cases) time-offset relationship, Field procedure, Application of seismic refraction method.Reflection methods: Geometry of reflection ray path. Horizontal & dipping beds (two layer cases). Time distance relationship, Multiples, seismic noise and their cause.2D reflection survey: spread geometries. Common depth point shooting and its advantages. 3D reflection survey: geometries with swath shooting and cross spreads	12
4	**Seismic Data Processing:** Introduction to seismic data processing, 2D Processing sequences – preparation of processing geometry, quality checks, true amplitude recovery, deconvolution, filtering, velocity analysis, residual statics, noise elimination through multichannel filtering, parameter optimization for generation of final stacked section, DMO and migration, wavelet processing. 3D processing techniques – generation of time slice and stacked sections. **Seismic Data Interpretation:** Study of seismic section and other geological aspects of prospecting, geological structural interpretation & seismic stratigraphic interpretation.	12
5	**Reservoir Geophysics:** Introduction to multi component seismic survey. Application of 3D and 3C seismic data in reservoir studies. AVO: types, classifications & importance. Vertical Seismic Profiling (VSP): acquisition, processing and interpretation. Use of cross-hole seismic tomography and AVO in reservoir management. Subsea completion, planning production monitoring and control system.	7
	Total	40

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6PE5-11: Petroleum Refinery Engineering
(Common with Chemical/Petrochemical Engineering 6CH4-05/6PC4-05)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**Separation Processes:** Atmospheric Distillation, Vacuum Distillation. **Cracking Process:** Thermal conversion processes. Conventional thermal cracking process. Visbreaking, Coking – Fluid coking, Flexicoking, delayed coking etc.	15
3	**Reforming:** Catalytic conversion processes – fluid catalytic cracking, Hydrocracking, hydrogen production, Reforming. **Purification process** Alkylation, Polymerization process of crude oil. Isomerisation and Hydrotreating processes crude oil.	14
4	**Crude oil Evaluation:** Evaluation of crude oil for LOBS (Lube oil base Stock). Steps in preparation of LOBS, deasphalting. **Solvent Extraction**: Types of solvents available and their comparison, dewaxing. Hydro finishing of LOBS Hydrogenation processes for LOBS production.	10
	Total	40

6PE5-12: Process Dynamics and Control
(Common with Chemical/Petrochemical Engineering 6CH4-04/6PC4-04)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	**First–order Systems**: Introduction, Transfer Function, Linear Open-Loop Systems, Transient response (step response, impulse response, and sinusoidal response), response of first order systems in series. Non-interacting systems and interacting systems. **Second-order systems**: Transfer function, step response, impulse response, k sinusoidal response, transportation lag.	10
3	**Linear closed-loop Systems:** Control System: components of a control system block diagram. Negative feedback and positive feedback, servo problem and regulator problem. **Closed-Loop Transfer functions:** Overall transfer function for single loop systems, overall transfer function for set-point change and load change, multi-loop control systems. Transient Response of simple control systems: P and PI control for set point change and for load change.	10
4	**Controller and final control element**: Mechanism of control valve and controller, transfer functions of control valve and controllers (P, PI, PD, and PID). Examples of a chemical reactor control system. **Stability**: Concept of Stability, Stability criteria, Routh test for stability, Root Locus.	10
5	**Frequency Response**: Introduction to Frequency Response, Bode Diagrams for First and second order systems, Bode stability Criteria, Ziegler-Nichols and Cohen-coon Tuning rules.	9
	Total	40

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6PE5-13: Polymer Science & Technology
(Common with Chemical/Petrochemical Engineering 6CH5-13/6PC5-13)

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Classification of polymers, Linear branched and cross-linked polymers, Molecular weights of polymers.Polydispersity and Mol. Wt. distribution in polymers. Random, alternate, block and graft co-polymers, polymer characterization techniques, polymer degradation. Kinetics of chain & Step polymerization, techniques of molecular weight control. Initiators, Chain transfer agents, Inhibitors. Techniques of polymerization.	20
3	Bulk, Solution, Suspension & Emulsion polymerization. Introduction to polymer rheology, Newtons law of viscosity, viscometris plots, rheometers. Rheological models, theory of viscoelasticity, Heat distortion temperature. Basic concept of polymer processing: Compounding methods, Extrusion moulding, Injection moulding. Blow moulding, Rotational moulding. Introduction to fibre reinforced plastics.	19
	Total	40

6PE4-21: Petroleum Product Testing Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+4P **End Term Exam: 3 Hours**

List of Experiment

1. Measurement of fire point- Flash point
2. Measurement of Cloud point and pour point.
3. Measurement of Aniline point & Bromine number
4. Measurement of Reid Vapour Pressure
5. Measurement of Sulphur Content
6. Measurement of Carbon Residue.
7. ASTM Distillation of Petroleum Products.
8. Measurement of surface tension by Tensiometer.
9. Measurement of surface tension by Platinum ring method.
10. Determination of smoke point.

6PE4-22: Health Safety & Environment Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**
0L+0T+2P **End Term Exam: 2 Hours**

List of Experiment

1.Toxicity, Physiological, Asphyxiation, respiratory and skin effect of Petroleum Hydrocarbons (including mixtures), sour gases (e.g. Hydrogen sulphide and carbon monoxide etc) with their thresh-hold limits.

2. Effect of corrosive atmosphere and additives during acidizing, sand control and fracturing jobs etc.

Safety System:

1. Hazards analysis, developing a safe process, failure mode analysis, safety analysis (API-14C) safety analysis function evaluation chart (synergic approach).
2. Manual & atmospheric shut down system, blow down systems.
3.Gas detection system
4. Fire detection and suppression systems.
5. Personal protection systems & measures.
6. HSE Policies, standards & specifications
7. Disaster & crisis management.

Environment:

1. Environment concepts, impact on eco-system, air, water and soil.
2. The impact of drilling & production operations on environment, Environmental transport of petroleum wastes.
3. Offshore environmental studies, offshore oil spill and oil spill control.
4. Oil mines regulations and other environmental legislations.

6PE4-23: Seismic Prospecting & Formation Evaluation Lab

Credit: 1 **Max. Marks: 50(IA:30, ETE:20)**

0L+0T+2P **End Term Exam: 2 Hours**

List of Experiment

1. Study of SP and Gamma Ray logs to identify bed boundaries.
2. Identification of fluid types in pore spaces by resistivity logs
3. Computation of static temperature from the bottom hole temperature data
4. Computation of permeability from charts and equations
5. Computation of porosity of the formation using porosity logs
6. Find out the lithology of given data using cross plot.
7. Computation of Volume of shale from integrated approach.
8. Find out hydrocarbon saturation from*Archie equation & Indonesian Equation.*

Seismic data analysis:

1. Horizon, picking from seismic section.
2. Identification of geological structures from seismic section.
3. Map building & Seismic well log tie.
4. Interpretation of depositional features from seismic section.

6PE4-24: Separation Process Lab

Credit: 2 **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+4P **End Term Exam: 3 Hours**

List of Experiment

1. To determine diffusion coefficient of liquid vapour in air.
2. To study the mass transfer characteristics of a wetted wall column.
3. Liquid-liquid extraction in a packed column for co current and counter current flow of binary systems.
4. To study the absorption of a gas in a packed column and calculation of NTU and HTU.
5. Studies on solid-liquid extraction column. Studies on the sieve plate distillation unit.
6. Design of distillation Tower.
7. Air fuel ratio in a gas burner.
8. Pyrolysis and characterization of pyrolysis products

6PE8-00: Social Outreach, Discipline & Extra Curricular Activities (SODECA)

Credit: 0.5 **Max. Marks: 25**