DEPARTMENT OF GEOLOGY

M.SC. PETROLEUM TECHNOLOGY

Program Objective (PO)

PO1: Scientific knowledge: Apply the knowledge of science and allied subjects to the understanding of scientific processes and related phenomena

PO2: Problem analysis: Identify research problems, review research literature, and analyze the complexities of scientific interactions

PO3: Design/development of research solutions: Design processes/strategies that meet the specified needs with appropriate consideration for the societal impact, along with societal and environmental considerations

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

Program Specific Objective (PSO)

PSO1: Students will learn various skills in Petroleum Industry.

PSO2: Students will gain the knowledge about oil industry covers upstream & downstream.

PSO3: Project work helps the students to interaction with the industry.

PSO4: Students will be eligible for various competitive exams.

Course Outcomes

FYMSC Petroleum Technology Semester- I

PTUT 111: Fundamentals of Petroleum Geology

CO1: Students can get the knowledge of Unconventional resources of Hydrocarbons by using various techniques used in exploration and production.

CO2: Students can get to know the different Theories of Organic and Inorganic compounds which are produced from the wellbore. The types of Kerogen phases according to the environment, Oil window where the oil production is profitable can be studied.

CO3: Students can understand the difference between the Reservoir Rocks, Sandstone, Carbonate, Fractured Reservoir rocks which has importance in real data monitoring.

CO4: Students can classify Geographic and Stratigraphic distribution of Oil and Gas according to the traps, salt domes present.

PTUT 112: Sedimentology

CO1: Students can get the knowledge and identity the parental rocks, different types of sedimentary rocks.

CO2: Students can understand the fluid properties & motion: a) Physical properties of fluid b) Stokes law, c) Reynolds number & Froude number d) Laminar & Turbulent flow, Modes of transportation of sediment grains: Sediment gravity flows: a) Grain flows, Debris flows, Liquefied flows & Turbidity flows b) Deposits of sediment gravity flows.

CO3: Students can understand the Environments - Erosional & Depositional. Outline of recognition / reconstruction of ancient depositional environments.

CO4: Students can classify the Geo Tectonic Classification and Distribution of Petroliferous, Basins in Geological Time with tectonic set up, statistics environments, and can Study the Indian Sedimentary Basins.

PTUT 113: Structural Geology in Petroleum Exploration

CO1: Students can classify and study of traps for oil and gas accumulation, the Traps on closed anticlines, the Closure and closed area of faulted structures.

CO2: Students can learn the Base maps, Topographic maps, Photo geological maps, Geologic and areal maps, Palaeogeologic and palaeoareal maps, Palinspastic maps, Equal value maps, Structure contour maps, Reconnaissance and details maps.

CO3: Students can learn about the Stratigraphic and structural relations at the unconformities Truncation, Overlap, Onlap, Offlap, Transgression, Regression.

CO4: Students get more idea about the Oil and gas production from salt domes Oil and gas fields associated with buried hills, Traps within buried hills, Traps in sediments around buried hills, Traps over buried hills, buried hills and recurrent folds, Production from traps associated with buried hills.

PTDT 114: Stratigraphy and Micropaleontology

CO1: Students can get knowledge of types of Microfossils, their size, characters and range and can learn the Uses of Microfossils in geological operations.

CO2: Students can understand the morphology, ecology and range and utility of Acritarchs, Tasmanitids, Spores, Pollens, Silicoflagellates, Diatoms, Coccoliths,

Dinoflagellates, Tintinnids & Calpionellids, Radiolarians, Conodonts, Sponge Spicules.

CO3: Students can understand the Biostratigraphy of Petroliferous Basins Of India With Reference to Forams And Ostracod: Cambay Basin, Bombay Offshore Basin, Cauvery Basin, Krishna-Godaveri Basin, Assam-Arakan Basin, Jaisalmer Basin.

CO4: Students can understand the Palynology and Biostratigraphy of Petroliferous Basins of India -Morphology of Pollens & Spores.

PTDP 114: (Practical's related to PTDT 114)

CO1: Students can understand the micropaleontology with the Separation of Micro Fossils from the Matrix of sedimentary rocks.

CO2: Students can search for microfossils in the Shale, Clay Stones, Limestones, Chert Dolomite, Coal – Shales for Pollens & Spores.

CO3: Students can able to study different types of genera can be classified like the Nodosarides , Bolivina, Ammonia, Elphidium, Quinqueloculina, Globorotalia, Globogerina, Textularia.

CO4: Students can learn more about Ostracods -General Morphology & Orientation of Carapace. Candona –Morphology, Composition.

PTUP 115: (Practical's related to PTUT 111, PTUT 112, PTUT 113)

CO1: Students can understand the Isopach maps, panel diagram, Surface tension of organic fluids by travelling microscope.

CO2: Students can able to interpret the Structure contour maps by determining the closure of folds, faults, intersecting faults & faulted structures from structure contour maps.

CO3: Students can determine the order of priority to drill the various structures for oil & gas which can be used in practical form.

CO4: Students can learn about the Dip isogons- drawing & significance of dip isogons; Ramsay's classification of folds based on stacking of folded surfaces.

Semester II

PTUT 121: Petroleum Geochemistry

CO1: Students can classify different types of paraffin's, Cycloparaffins OR Naphthenic, Aromatic Hydrocarbons, Olefin, Diagenesis.

CO2: Students can see the Composition, Classification, Origin and alteration of Oil Field Brines.

CO3: Students understands the Density, Viscosity, Surface Tension, Color, Fluorescence, Cloud Point and Pour Point, Aniline Point, Optical Properties, Flash Point, Refractive Index and Calorific Value of oil.

CO4: Students understands the Distillation and Classification of Petroleum- First, Second and Third Generation Petrochemicals.

PTUT 122: Depositional System Analysis and Petroliferous Basin of India

CO1: Students get the models understanding like -Fluvial models- Basic fluvial systems / models with their discharge characteristics, spectral dip oriented facies types, Classification and sub facies of alluvial systems, Depositional models of Braided fluvial system.

CO2: Students can recognize the sedimentary and tectonic factors in fluvial / deltaic systems- Effect of tectonism in sedimentary basins on fluvial / deltaic systems.

CO3: Students can understand different deep sea environment.

CO4: Students can able to classify the Petroliferous Basins of India- Bombay basin, Krishna-Godavari basin, Assam basin, Cauvery basin, Rajasthan basin.

PTUT 123: Petroleum Exploration Techniques

CO1: Students can Use of aerial photographs, satellite imageries, and radar imageries in structural or litho logical mapping for Petroleum Exploration which is an quick and efficient technique.

CO2: Students can learn about Magnetic field of the Earth, Magnetism of Rocks and Minerals, Field Procedures, Reduction of Magnetic Anomaly Maps and Profiles, Airborne Magnetometers.

CO3: Students can use the Gravitational field of the Earth, Densities of Rocks and Minerals, Measurement of Gravity Instruments, Field Procedures, Reduction of Gravity Data, Gravity Modelling, Gravity Anomaly Maps and this data in field.

CO4: Students can use the seismic method using this seismic properties like- Seismology and Seismic Prospecting, Elastic Properties of rocks, Refraction and Reflection of seismic waves, general scheme of Seismic Prospecting; Seismic Body Waves, Seismic Surface Waves, Waveguides, Seismograms, The source Wavelets, Geometrical Spreading and Absorption.

PTDT 124: Environmental Management and Economics

CO1: Students can use air pollution data for Precautionary Measures and try to relate it with the incidents happened in oil and gas exploration.

CO2: Students can learn about the importance of Flaring - Diversity in Flaring , Smoke less Flare, Environmental factors associated with flaring Operations,

CO3: Students can uses all the new policies related to New income projects, Present Day Value (PDV) concept, Effect of PDV on project analysis; Rate of return, Acceleration projects, Long term capital expenditures etc.

CO4: Students can learn the risk and uncertainty in hydrocarbons exploration - Geological, Price, Political, Macro Economic, Business, Environment and Project Risk.

PTDP 124: Practical's related to PTDT 124

CO1: Students can learn the major part of Decision tree analysis and solve the Problems on production economics.

CO2: Students can solve Problems related to air, sound, water & soil pollution by taking the industry problems into consideration.

CO3: Students can mark the Correlation and regression, Multivariate analysis, Analysis of Variance according to sequence stratigraphy.

CO4: Students can simulation on Geostatistics (Kriging), Monte Carlo simulation.

PTUT 125: Practicals (related to PTUT 121, PTUT122, PTUT123)

CO1: Students can enhance the knowledge of surface tension by using travelling microscope, can use viscometer to determine the chemical composition of hydrocarbons.

CO2: Students can learn about Petroleum Geology- bulk porosity of reservoir rock with single pan balance, refractive index of an organic compound.

CO3: Students can learn about the isopach maps, its closure, closed area, closure of folds and faults.

CO4: Students can learn resistivity data from VES, structures from bouger anomaly maps, can draw seismic section from seismic data

SY MSC PETROLEUM TECHNOLOGY

Semester III

PTUT231 - Reservoir Dynamics

CO1: Students learn to geologically describe a reservoir, identify the various reservoir conditions like temperature, pressure and fluid properties by studying the basic concepts of reservoir rock and fluids which help hence identify different drive mechanism with respect to different and types of petroleum reservoirs.

CO2: The students are now able to identify and understand different fluid flow mechanism, Influence of Reservoir Conditions on Producing Characteristics of

an Oil Well, and understand different techniques of Estimation of Hydrocarbon reserves.

CO3: The practical knowledge related pay zone thickness, lithology, rock porosity, rock total compressibility, and rock permeability. These properties affect fluid flow within the reservoir and thus well productivity. Reservoir engineers must understand these properties to simulate reservoir behaviour and to predict well productivity for exploration and production.

CO4: The students can correlate the physical properties of petroleum reservoir fluid including laboratory and empirical methods, PVT report interpretation and application of equations of state in more practical way.

PTUT 232 -Formation Evaluation-I

CO1: Students learn about the basic well logs like Gamma ray, Temperature, calliper resistivity, SP logs which make them able to evaluate the subsurface formation.

CO2: Students apply the knowledge of basics logs to identify the petro physical properties like porosity and permeability and saturation of reservoir fluids

CO3: Students and apply this theory knowledge in Real Time Data Service where the real data from the rig site comes to analyse and interpret.

CO4: Students can apply this knowledge in oil and gas industry the acquisition and analysis of ,geophysical data performed as a function of well bore depth, together with the provision of related services.

PTUT233: Drilling & Well Completion

CO1: Students learn to geologically describe a reservoir, identify the various reservoir condition like temperature, pressure and fluid properties by studying the basic concepts of reservoir rock and fluids which help hen identify different drive mechanism with respect to different and types of petroleum reservoirs.

CO2: The students are now able to identify and understand different fluid flow mechanism, Influence of Reservoir Conditions on Producing Characteristics of an Oil Well, and understand different techniques of Estimation of Hydrocarbon Reserves.

CO3: The students are able to use and apply the drilling knowledge practically in exploration for and extraction of oil, gas, geothermal, and mineral resources.

CO4: The students can identity different activities related to casing design, well completion, kicks, blowouts, lost circulation etc.

PTDT 234: Directional Drilling , Non-conventional resources and safety

CO1: Students can understand the types of wells, well planning, BHA Designing, Hydraulics, torque, bit selection.

CO2: Students can understand the field aspects of directional drilling- RPM, TRQ, SPP, Off bottom and on bottom torque, WOB, Hook load, PDM, RSS, hole cleaning etc.

CO3: Students can learn about Nonconventional resources- shale gas, coal- bed methane, gas hydrates, hydro fracturing, horizontal well jobs.

CO4: Students can understand the importance of safety and hazards- JRA/JSA, PTW, HUET, TBT PJSM, use of OBM, MSDS & COSHH, fire and H2S drills etc.

PTDP 234: Practical related to PTDT 234

CO1: Student can learn more about problems related to Rig power system, Pump stroke calculations, Drill collar weights.

CO2: The student can understand the importance of Drilling as the practices of Cementation, Dog leg Severity, Orientation of the Deflected Tools, Pull required to stuck pipe, Life of a well which gives a overview of drilling can be learnt.

CO3: Student can learn about the tool face with the major problems faced by the industry.

CO4: Students can learn the problems which are more practically faced by the industry today.

PTUP 235: Practical related to PTUT 231, PTUT 232, PTUT 233

CO1: Student can learn more about the net volume of reservoir, formation volume factor, behaviour of gases, perfect gas law.

CO2: Student can estimate the hydrocarbon reserves, specific gravity of gases, fluid flow of reservoirs etc.

CO3: Students study various practical aspects which make them able to solve real time problems related to Fluid flow of Reservoirs, net volume of reservoir, Formation volume factor from surface data, Behaviour of gases at reservoirs, Calculation of formation volume factor from charts, Diffusivity equation and its practical applications, The perfect Gas Law, Estimation of hydrocarbon Reserves, Specific gravity of reservoir fluids & gases.

CO4: Students are able to identify lithology and petrophysical properties by using Cross plots and Overlays: Porosity Overlays, Two-porosity Lithology Cross plots, The DensitySidewall Neutron Cross plot, Gas Saturation Cross plots and Shale Cross plot.

CO5: Students can solve the problems related to mud like Mud weight – computation, Mud calculations, Mud engineering.

CO6: Students can solve and relate the actual problems related to abnormal pressure, overpressure and solve the Pressure Loss calculations which the essential and important part in oil industry.

Semester IV

PTUT241-Reservoir Performance

CO1: students study the different type of tests related to reservoir performance and production like which make them able to characterize the reservoir and understand the flow behaviour and factors affecting the flow of fluids in a reservoir.

CO2: Students study about various recovery oil techniques and basic calculations which make them able to prepare basic mathematical models related to reservoir performance with respect to time.

CO3: Students can make models of reservoir simulation -Designing a reservoir model: Tank model, one-dimensional models, 2D aerial models, 2-D, 3-D models which is an important part of oil industry today.

CO4: Students can take into consideration the Enhanced Oil Recovery- secondary recovery of crude oil, initial production of oil, pressure maintenance, water flooding, and immiscible gas injection. Tertiary which helps in extra production of hydrocarbon.

PTUT242 -Formation Evaluation II

CO1: Students study the different type of tests related to reservoir performance and production like which make them able to characterize the reservoir and understand the flow behaviour and factors affecting the flow of fluids in a reservoir.

CO2: Students study about various recovery oil techniques and basic calculations which make them able to prepare basic mathematical models related to reservoir performance with respect to time.

CO3: Students can understand the importance of Effect of Secondary porosity, Effect of Gas and Shale, Mineral Identification – Evaporites, Sulphur, Coal, Metallic ores, Oil Shale which plays a major role in real time data.

CO4: Students can relate the charts Using lithology-porosity charts like the M-N cross plot & MID cross plot to know the porosity.

PTUT243-Production Operations

CO1: Student is able to solve problems related to Pressure build up tests for oil reservoir, Productivity Index tests, Calculation of Unit Recovery, Material Balance Equation, Pressure build up tests for gas reservoirs, Gas Deviation factor, Productivity tests, Estimation of feature behaviour of reservoir, Problems on Improved Oil Recovery (IOR).

CO2: Students become able to asses and interpret Geological Consideration in Producing Operations, Sand control, Surfactants for Well treatments.

CO3: Students become able to apply the concepts of well stimulation like Acidization, Hydraulic fracturing and Corrosion control.

CO4: The student becomes aware of different factors related to Workover, Planning, Completion and Workover Fluids.

PTDT 244- Mud-logging & Mud- Engineering

CO1: Students become able to identify and calibrate various surface logging sensors, interpret various parameters related to drilling and logging.

CO2: Students learn the technique of sample catching, coring.

CO3: The student becomes able to make master log and well report, sample description and gas measurements.

CO4: The student also is able to understand mud properties, and mud engineering factors.

PTDP 244: Practical related to 244

CO1: Student is able to solve problems related to Pressure build up tests for oil reservoir, Productivity Index tests, Calculation of Unit Recovery, Material Balance Equation,

CO2: Students can learn more about Pressure build up tests for gas reservoirs, Gas Deviation factor, Productivity tests in practical form.

CO3: Students can perform the lag time calculations, Pit gain calculations which has a major importance in oil and gas industry.

CO4: Students can calculate the mud density, problems related to mud, surge and swab pressure, oil and water ratio calculation.

PTUP 245: Practical related to PTUT 241, PTUT 242, PTUT 243

CO1: Students can learn to determine of water saturation, determination of spacing between transmitter & receiver of sonic log, Determination of porosity from sonic log and correlating porosity values using compaction correction

CO2: Students can Determine the shale percentage and (F_ correction from neutron –density log, Cross plots and overlays, Determination of shale percentage & (F_ correction from neutron- density cross plot, Porosity estimation in hydrocarbon Zones F (N)&_F (D), Density- Side Wall Neutron log analysis.

CO3: Students can solve Problems on Reservoir stimulation can be solved practically.

CO4: Students can estimate the feature behaviour of reservoir, Problems on Improved Oil Recovery (IOR), Applications of Computers in Reservoir Studies.

CO5: Students can get the knowledge of acidizing, hydraulic fracturing etc.

CO6: Students can make oil and gas separator design, apply this knowledge using different software to perform production operation activities.