ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

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Department of Petroleum Technology

M.Tech. (Petroleum Engineering) - AR17 - Course Articulation Matrix

Note: Enter Correlation Levels 1 or 2 or 3. Where: 1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

	CO Statements	POs											PSOs		
I SEM															
Course Code	**172PE1T01-Advanced Numerical Methods & Applied Statistics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Compute the values of single and double integrals using numerical methods.	-	-	3	1	1	-	-	-	-	-	-	2	-	-
CO2	Solve ordinary differential equations using numerical methods	2	3	3	1	2	-	-	-	-	-	-	3	-	-
CO3	Apply implicit and explicit methods to solve partial differential equations	2	2	3	1	-	-	-	-	-	-	-	3	-	-
CO4	Solve boundary value problems using finite element methods	2	3	3	1	2	-	-	-	-	-	-	-	1	-
CO5	Find probabilities of two-dimensional random variables, hazard rate and reliability of probability distributions	1	3	-	3	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE1T02-Transportation of Oil & Gas**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain pipeline operations & maintenance	-	-	-	-	-	2	-	3	1	-	-	2	-	-
CO2	Illustrate flow assurance challenges for subsea pipelines	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Demonstrate wax and asphaltenes management strategy and philosophies	-	3	2	2	-	-	-	-	2	-	-	3	-	-
CO4	Classify transportation of crude oil and natural gas pipelines	2	-	-	-	3	-	-	-	-	-	-	-	1	-
CO5	Calculate the computer simulation of the subsea systems, hydrates by thermal insulation and heat transfer flow in pipeline system	-	2	-	-	3	-	-	-	-	-	-	-	-	1

	CO Statements	POs											PSOs		
Course Code	**172PE1T03-Advanced EOR Techniques**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify specific reservoir before designing of any EOR project	-	-	-	-	3	-	2	-	-	3	-	2	-	-
CO2	Classify various techniques of EOR	-	-	-	-	-	3	3	2	-	-	2	3	-	-
CO3	Make use of safety precautions while handling of various types of chemicals used in EOR	2	3	-	3	-	-	-	-	-	-	-	3	-	-
CO4	Explain reservoir managers/production engineers in monitoring the reservoir after post-project activities in CO_2 flooding	-	2	-	-	-	-	-	-	-	3	-	-	1	-
CO5	Apply the regulations and economics to EOR operations.	-	-	-	-	-	3	3	2	3	2	-	-	-	1
Course Code	**172PE1T04-Project Management**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify specific management needs of the individual, team, division and/or organizational level	-	-	-	-	-	-	3	3	-	3	-	2	-	-
CO2	Explain practical applications of project management to formulate strategies allowing organizations to achieve strategic goals	-	-	-	-	-	3	-	-	2	-	-	3	-	-
CO3	Select perspective of leadership effectiveness in organizations	-	-	-	-	-	-	3	-	-	-	3	3	-	-
CO4	Describe team-building skills required to support successful performance	-	-	-	-	-	-	-	2	3	-	-	-	1	-
CO5	Impart critical-thinking and analytical decision-making capabilities to investigate complex business problems to propose project-based solutions	-	3	3	-	2	-	-	-	-	3	-	-	-	1
Course Code	**172PE1T05 -Offshore Drilling**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain deep-water applications of subsea technology	3	-	-	-	-	3	-	-	-	-	-	2	-	-
CO2	Classify offshore oil and gas operations considering the real scenarios	-	-	3	-	3	-	-	-	-	-	-	3	-	-
CO3	Interpret offshore drilling and well completion operations	-	-	-	-	3	-	-	-	-	2	-	3	-	-
CO4	Explain develop directional drilling techniques considering MWD, LWD	2	1	-	-	-	3	-	-	3	-	-	-	1	-
CO5	Demonstrate the concepts of decompression chambers, life boats-Offshore environmental pollution, and remedial measures	-	-	-	-	-	-	-	-	3	-	-	-	-	1

	CO Statements	POs											PSOs		
Course Code	**172PE1T06- A Fundamentals of Petroleum Geology & Reservoir Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Classify origin of source rocks, different from reservoir rocks, different source and characterization of reservoir rocks	3	2	-	-	3	-	-	-	2	-	-	2	-	-
CO2	Explain how and why fluid hydrocarbons migrate from a source rock to reservoir rock, entrapment, and accumulation of hydrocarbons.	2	-	-	-	3	-	-	-	-	3	-	3	-	-
CO3	Apply some basic concepts in reservoir engineerings such as recovery factor phase behavior and material balance	3	-	-	-	-	-	-	-	-	2	-	3	-	-
CO4	Apply Darcy's law, two-phase flows, effective and relative permeability.	-	1	-	-	-	3	2	-	-	-	-	-	1	-
CO5	Apply the basic differential equation for radial flow in a porous medium	-	2	2	-	3	-	-	-	-	-	-	-	-	1
Course Code	**172PE1T07 - Reservoir Stimulation**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain various approaches to properties of formation materials	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Solve the data for the formation damage, well test and perforations	-	-	-	-	-	-	-	3	1	-	-	3	-	-
CO3	Apply the hydraulic fracturing approaches using geometry, fluid temperature, and conductivity	-	-	3	-	3	-	-	-	-	-	-	3	-	-
CO4	Solve practical problems in reservoir fracturing and remedies to resolve the same in matrix acidizing of sandstones	-	-	3	-	-	2	-	-	2	-	-	-	1	-
CO5	Apply gravel packing, consolidation techniques and sand control	2	-	-	2	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE1T08 -Petroleum Drilling & Production Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply drilling concepts from well planning to rig mobilization to the location	3	2	3	-	-	2	-	-	-	-	-	2	-	-
CO2	Explain the suitable casing, cementation design, well control, stuck pipe, fishing problems and drillers log	-	2	-	1	-	-	-	-	-	-	-	3	-	-
CO3	Calculate productivity index (PI), inflow performance relationships (IPR) for oil and gas wells.	2	-	-	-	-	-	-	2	-	-	-	3	-	-
CO4	Calculate well performance with concepts of single and multi-phase fluid flow in pipes considering energy and pressure losses	-	-	2	-	-	2	-	-	-	-	-	-	1	-
CO5	Apply nodal analysis by performance prediction and surface pressure optimization evaluation of choke performance	-	-	-	3	-	3	-	-	-	-	-	-	-	1
Course Code	**172PE1L01-Advanced Numerical Methods & Applied Statistics (MATLAB Based) Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply numerical methods to evaluate integrals using MATLAB.	-	2	3	1	1	-	-	-	-	-	-	-	3	-
CO2	Apply numerical methods to solve first order differential equations using MATLAB	1	3	3	1	2	-	-	-	-	-	-	-	3	-

	CO Statements	POs											PSOs		
CO3	Solve partial differential equations using MATLAB.	2	2	3	1	2	-	-	-	-	-	-	-	3	-
CO4	Solve problems concerned with linear and non-linear algebraic equations	2	3	3	1	2	-	-	-	-	-	-	1	2	-
CO5	Compute probabilities of two dimensional random variables	1	3	3	1	2	-	-	-	-	-	-	1	2	-
II SEM															
Course Code	**172PE2T09-Advanced Natural Gas Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain natural gas properties and application of suitable techniques for natural gas exploration and production	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply the Darcy and non-Darcy flow regimes in natural gas production and processing	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Summarize on gas hydrate control, pigging and liquefied natural gas	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Explain gas-to-liquids and underground natural gas storage	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Select and design of natural gas supply economics, environmental impact of fossil fuels and renewable energy sources	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2T10-Artificial Lift Techniques**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamental concepts of artificial lift techniques such as reservoir pressure, well productivity and reservoir fluids	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply sucker rod lift system, polished rod motion, FRP sucker rods, criteria for rod string design with advantages and limitations	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply gas lift, gas compression requirements sonic flow, subsonic flow, volumetric efficiency advantages and limitations	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Explain electrical submersible pumps, principle hydraulic piston pumping advantages and limitations	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Explain hydraulic jet pumping advantages and disadvantages	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2T11-Operational Aspects of Well Testing**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the mobilizing equipment, well test planning and input data sheet	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Explain HSE Policies, site preparation & start of testing operations	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply different perforation test and relevant down hole equipment under pressure gauges	3	2	-	-	-	-	-	-	-	-	-	3	-	-

	CO Statements	POs											PSOs		
CO4	Select surface test equipment, oil & gas metering equipment hook-up location, well test operations.	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Apply reservoir fluid behavior and sampling operations for well testing	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2T12-Integrated Reservoir Management**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the working principles of an oil and gas asset management	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply the setting goals, developing plan & economics, case studies functions of each segment of an asset	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply the concepts & terminology of data-role of reservoir models such as geosciences, seismic data, geostatistics and integration	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Explain natural producing mechanisms, material balance methods mathematical simulation and its economics	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Calculate economic evaluation case studies with risk, uncertainties and economic optimization	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E01-Practical Reservoir Modeling & Simulation (Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply properties of single phase fluid, porous media, reservoir discretization, multidimensional flow in cartesian, radial, cylindrical coordinates.	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Calculate flow equations using CVFD terminology, cylindrical coordinates and block ordering scheme	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply reservoir discretization for block centred and point distributed using boundary conditions and its use in solving practical problems	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Apply single and multi block wells, practical considerations dealing with modelling and well conditions	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Calculate nonlinear terms in flow equations for various fluids, linearization of nonlinear terms and equations in time, direct solution methods	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E02-Optimization of Oil & Gas Production (Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain production system modeling, nodal analysis, economic, environmental, technical objectives	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply governing equations, pressure drop analysis, multi-phase flow in wells, pipelines, and chokes	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Calculate governing equations inflow performance relationship, formation damage, and skin-multi layer	3	2	-	-	-	-	-	-	-	-	-	3	-	-

	CO Statements	POs											PSOs		
CO4	Apply production rate of a vertical well operating at given tubing head pressure and through a surface choice	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Illustrate short term and long term optimization of well performance and productivity of horizontal wells	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E03-Flow Assurance (Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Solve flow assurance calculations and size the piping & distribution system	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Explain the concepts of non-Newtonian fluid & friction, transient flow, transient flow and heat transfer fundamentals	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply the concepts of emulsion, phase behavior, hydrocarbon flow, single, two, three & four phase regimes during design	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Apply three phase gas-liquid-solid flow	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Explain the concepts of wax management, asphaltenes, hydrate remediation interpret phase behavior and hydrocarbon flow	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E04-Process Safety & Environmental Aspects in Petroleum Industry (Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply knowledge of various acts related to safety, health, and environment in petroleum industry	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Explain various drilling fluids properties and safe disposal such toxic products	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Explain about distinction between flammability diagram, ignition energy, auto ignition, inserting, static and controlling static electricity	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Apply concepts, definitions, locations, types, scenarios, data for sizing, relief systems, hazard identification	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Apply probability study, event trees, fault trees, QRA, LPOA, environmental impacts in drilling and production	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E05-Deep Water Technologies (Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Solve and size the analysis of waves and fluid-induced forces on offshore structures, Current and wind forces	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Explain the deepwater exploration and deepwater drilling	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply the concepts of fixed platforms, compliant towers, subsea systems, extended reach wells and floating production systems	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Extend innovative subsea completion, installation and associated problems	2	1	-	-	-	-	-	-	-	-	-	-	1	-

	CO Statements	POs											PSOs		
CO5	Illustrate deep-water pipelines, flow assurance strategies and subsea innovations	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2E06-Characterization of Petroleum Oils (Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply characterization of hydrocarbons, prediction of molecular wt. and acentric factor	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply experimental data on basic properties of petroleum fractions, prediction, conversion of distillation data and development of predictive methods	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Illustrate specifications of reservoir fluids and crude oils, calculation of properties of crude oils and reservoir fluids	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Explain phase rule, PVT relations, generalized correlation for PVT properties of Liquids-Rackett equation and RI based equations of state	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Apply thermodynamic properties of mixtures and methods for calculation of properties of real mixtures	2	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**172PE2L02-Reservoir Simulation Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply properties of single-phase fluid, porous media, multidimensional flow in cartesian coordinates, radial, cylindrical coordinates	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Calculate flow equations in radial, cylindrical coordinates, block ordering scheme	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply reservoir discretization for transmissibility, symmetry and its use in solving practical problems	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Apply single block wells, multi-block wells, practical considerations dealing with modeling and well conditions, pressure dependence of fluid and rock properties	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Calculate nonlinear terms inflow equations and equations in time	2	1	-	-	-	-	-	-	-	-	-	-	-	1