Competency Matrix for Reservoir Engineers
SPE Task Force on Minimal Competency

Reservoir Task	Reservoir Knowledge/Skill		
	Minimum Competence Breadth	**Minimum Competence Depth**	**Above Minimum Competence**
Understand and apply basic and special core analysis.	Understand the conventional lab techniques for determining Ø, permeability and fluid saturations and know how to interpret the data.	Use routine core analysis data to group/correlate core data and determine permeability variation and heterogeneity.	Understand and apply special core analyses including capillary pressure/saturation-height relationships, correlation with well logs, estimation of free water level/transition zone, pore size distribution and relative permeability.
Perform reservoir characterization.	Understand how routine core analysis is used to identify net pay and fluid contacts.	Apply routine core analysis to identify net pay and determine gas-oil, oil-water and gas-water contacts. Evaluate vertical sweep efficiency from core/log data.	Using core and RFT data, integrate reservoir performance and well tests with geoscience data to determine reservoir layering and continuity. Reconcile measured data with known depositional environment.
Conduct log analysis and interpretation.	Understand the importance of various well logs to well correlation of petrophysical data.	Apply well log results (resistivity, FDC/CNL, gamma ray and sonic logs in open hole completions; and CBL, TDT, diplog, carbon oxygen and production logs in cased holes) to correlate porous and non-porous lithologic members from logs and cores. Interpret a production logging survey.	Perform qualitative interpretation and analysis in open hole and cased hole environments. Determine individual layer pressures and contribution to the total flow from each separate layer.
Perform PVT analysis.	Understand the significance of oil, gas and water PVT data and measurement, and application techniques.	Assess validity of PVT data, and adjust results to correct errors. Estimate PVT data from oil and gas properties and correlations.	Calculate PVT data from oil and gas compositional analysis using correlations or non-EOS model.
Understand and determine oil and gas phase behavior.	Understand the principles of phase behavior to distinguish the general properties and behavior of black oil, volatile oil, gas condensate and dry gas reservoir fluids.	Understand the principles of Equation of State and its use in fluid characterization.	Determine/analyze compositional effects.

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Determine initial reservoir conditions and fluid contacts.	Estimate initial reservoir pressure from static well pressure surveys. Determine gas-oil, oil-water, gas-water contacts from pressure-depth surveys.	Estimate reservoir pressure from interpretation of RFT/MDT survey.	Estimate reservoir pressure from interpretation of pressure transient tests.
Analyze single/multi-phase flow under reservoir conditions.	Calculate Bo above bubble point using oil compressibility.	Assess the productivity effects of relative permeability, imbibition, heterogeneity and gravity/capillary/viscous forces, fluid flow calculations.	Determine the productivity effects of relative permeability, imbibition, heterogeneity and gravity/capillary/viscous forces.
Determine initial oil or gas in place.	Calculate original oil or gas in place per acre-foot from rock and fluid properties. Understand material balance principles for determining initial oil or gas in place for volumetric reservoirs.	Determine initial oil or gas in place from geologic maps and rock and fluid properties. Apply material balance techniques, including gas cap and water influx, for determining initial oil and gas in place.	Incorporate J-curve Sw vs. height into oil and gas in place calculations. Manipulate various forms of material balance equations and determine most appropriate form for use for any type of situation to calculate original oil and gas in place.
Use conventional well test analysis to understand and perform reservoir analysis.	Understand the principles of well test design and analysis to evaluate well performance and reservoir characteristics.	Apply conventional well test data (including pressure build-up, draw down, fall-off/injection) to determine well performance and reservoir characteristics. Calculate vertical/horizontal well productivity indices.	Be familiar with testing and data from stimulated wells (hydraulically fractured, acid) and the use of tracer tests to analyze fluid flow paths. Calculate cold water skin effect for injection wells.
Estimate oil and gas reserves.	Understand the differences between different reserve categories, including proved, probable and possible categories.	Perform volumetric calculations and assign reserves to the appropriate reserve classification.	Understand and be able to apply statistical methods or reserve estimation using probability using appropriate ranges of uncertainty and probability estimates.
Perform oil and gas recovery estimates.	Understand appropriate ranges of recovery factors for given rock and fluid properties and drive mechanisms.	Assess appropriate recovery factor ranges and calculate recoveries for field or reservoir applying conventional (deterministic & performance) methods and drive mechanisms.	Determine appropriate and range of recovery factor for a wide range of rock and fluid properties for various recovery methods using a variety of techniques.

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Understand fluid flow characteristics of oil reservoirs and determine reservoir performance.	Understand various methods of assessing reservoir performance from production data.	Apply principles of drive mechanisms, material balance, pressure maintenance, recovery estimating, decline analysis and volumetrics to determine oil reservoir performance. Determine where to perforate production and injection wells taking into account degree of pressure communication and impermeable barriers.	Apply coning and multi-phase flow analysis to oil recovery calculations and optimal field development. Recommend when to cease production and recomplete a well.
Understand fluid flow characteristics of gas reservoirs and determine reservoir performance.	Understand various methods of assessing reservoir performance from production data.	Use drive mechanism, material balance (gas and condensate) for recovery estimation, decline analysis and volumetrics to determine gas reservoir performance.	Apply coning aspects of gas, back pressure and isochronal testing and tubing hydraulics and deliverability; application of optimal field development.
Analyze reservoir/fluid recovery under secondary or improved recovery mechanisms.	Understand the principles of water flood/gas injection.	Assess optimum waterflood/gas injection based on reservoir zonation, flood pattern analysis, injectivity and flood design.	Calculate recovery for area/vertical sweep, infill drilling, fractional flow and frontal advance. Estimate recovery from gas cycling in retrograde gas condensate reservoirs; determine optimum sweep efficiency.
Analyze reservoir/fluid recovery under tertiary or enhanced recovery mechanisms.		Know the main enhanced recovery mechanisms and have an appreciation of their application.	Understand the principles of reservoir/fluid behavior and recovery processes under miscible, chemical flooding, steam based thermal and combustion processes. Apply concepts of process design (e.g. profile control, pressures, temperatures, fluid composition, injectivity etc.) to compute incremental recovery performance.

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Understand and apply recovery processes to recovery from non-conventional gas reservoirs.	Know the main recovery processes from non conventional gas reservoirs.	Calculate reserves and well/reservoir performance for tight, fractured; understand the principles of production performance of coal-bed methane gas reservoirs.	Be familiar with analysis of gas recovery and water removal for coal-bed methane gas production.
Evaluate reservoir performance using reservoir simulation	Understand and apply reservoir simulation to analyze reservoir performance and optimize reservoir development.	Use basic reservoir engineering principles, including flow through porous media, relative permeability, nodal analysis and multi-phase flow to evaluate single well applications and black oil or gas reservoirs.	Be familiar with specialized simulation techniques (such as matrix solution methods, numerical analysis, vectorization, finite element/difference analysis and parallel processing). Determine areas of the reservoir that are unswept or inefficiently drained and identify new well locations with geological input.
Understand and apply decision & risk analysis to estimate recovery factor and reservoir performance prediction.	Understand the concepts of decision and risk analysis and have an appreciation of the key factors that control uncertainty in recovery factor and reservoir performance.	Can determine the key reservoir engineering and geoscience factors that influence recovery factor, number of wells required and production profile.	Can quantify reservoir engineering uncertainties in the context of other uncertainties using appropriate ranges of uncertainty and appropriate decision and risk analysis techniques.