CONCEPT

Prospect Evaluation and Risking: Play Fairways, Traps, Seals and Portfolio Ranking

4 – 15 July 2027
Riyadh - KAFD district five-star



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Ref: 559_17401 **Date:** 4 – 15 July 2027 **Location:** Riyadh - KAFD district five-star **Fees:** 35100 SAR

Introduction:

Prospect evaluation and risking often break down when basin setting, trap geometry and seal behaviour are judged separately, so chance of success drifts between teams and volumes are quoted as single numbers. Portfolios are then ranked on optimism rather than evidence. This Core Concept course trains exploration geoscientists to tie basin type and play fairway maps to structural trap styles, top seal capacity and fault seal analysis, then to probabilistic volumetrics and consistent geological chance of success. Participants produce a Risked and Ranked Prospect Portfolio for a case basin.

Course Objectives:

- Classify basins by tectonic setting and relate rift, passive margin, foreland and salt basin architecture to the plays each can host
- Map play fairways and build composite common risk segment maps that separate play chance from prospect-specific chance
- Interpret extensional, compressional, inversion, strike-slip and salt-related trap styles and test their timing with structural restoration
- Quantify top seal capacity, fault seal potential and fault reactivation risk to judge trap integrity and maximum column height
- Estimate prospect volumes with probabilistic input ranges and assign geological chance of success using consistent, calibrated risk scoring
- Rank a prospect portfolio on risked volume and expected value and defend a drill-or-drop recommendation

Target Audience:

- Exploration geology functions that generate leads and prospects and maintain play fairway maps
- Exploration geophysics functions that map closures, faults and structural styles for prospect definition
- New ventures and basin screening functions that assess acreage and farm-in opportunities in unfamiliar basins
- Prospect assurance and peer review functions that check volumes and chance of success before drilling decisions
- Exploration portfolio and planning functions that rank prospects and sequence drilling programmes

Course Outline:

Day 1: Basin Types, Tectonic Settings and Subsidence

- Rift Basin Architecture: Half-Grabens, Border Faults and Synrift Wedges
- Passive Margin Evolution from Thermal Subsidence to Deep-Water Fan Systems
- Foreland Basin Flexure: Peripheral and Retroarc Loading by Thrust Belts
- Salt Basins: Diapirs, Salt Walls, Welds and Allochthonous Canopies
- Backstripping and Subsidence Curves as Basin Analysis Tools at Overview

Day 2: Play Concepts and Play Fairway Mapping

- Play, Lead and Prospect Hierarchy within a Petroleum System Framework
- Gross Depositional Environment Maps for Reservoir Presence Fairways
- Regional Seal Presence Maps from Mudstone and Evaporite Units
- Common Risk Segment Maps: Traffic-Light Scoring per Play Element
- Composite Common Risk Segment Maps and Play Chance versus Prospect Chance

Day 3: Structural Geology for Trap Definition

- Extensional Trap Styles: Tilted Fault Blocks, Rollover Anticlines and Horsts
- Compressional Trap Styles: Fault-Bend, Fault-Propagation and Detachment Folds
- Basin Inversion Structures: Reactivated Normal Faults and Harpoon Geometries
- Strike-Slip Traps: Flower Structures, Restraining Bends and Pull-Apart Closures
- Salt-Related Traps: Turtle Structures, Flank Pinch-Outs and Sub-Salt Closures

Day 4: Structural Restoration and Fractured Reservoirs

- Cross-Section Balancing with Line-Length and Area Conservation Checks
- Sequential Restoration for Trap Formation Timing against Charge Timing
- Andersonian Stress Regimes and Predicted Fault and Fracture Orientations
- Fracture Intensity Controls: Curvature, Bed Thickness and Mechanical Stratigraphy
- Critically Stressed Fracture Sets and Open Fracture Networks in Tight Carbonates

Day 5: Week-One Guided Case: Play Fairway Review of a Case Basin

- Case Basin Data Pack: Regional Seismic Lines, Well Tops and Structure Maps
- Tectonostratigraphic Chart and Basin Type Interpretation for the Case Basin
- Reservoir, Seal and Charge Element Maps for Two Target Plays
- Composite Risk Map Build and Play Sweet Spot Identification
- Lead Inventory Sketch and Peer Challenge on Play Risk Scores

Day 6: Trap Closure and Top Seal Capacity

- Structural, Stratigraphic and Combination Trap Classification with Spill Point Definition
- Closure Mapping: Four-Way Dip, Fault-Dependent and Stratigraphic Closure Uncertainty
- Capillary Entry Pressure and Mercury Injection Data for Top Seal Capacity
- Hydrocarbon Column Height Calculation from Seal Capacity and Fluid Densities
- Seal Failure Modes: Capillary Leakage, Hydraulic Fracturing and Diffusion Loss

Day 7: Fault Seal Analysis and Trap Integrity

- Allan Diagrams and Juxtaposition Seal Analysis Across Fault Planes
- Fault Rock Membrane Seal: Shale Gouge Ratio, Clay Smear and Cataclasis
- Calibrating Shale Gouge Ratio to Across-Fault Pressure Differences
- Fault Reactivation Risk: Slip Tendency, Dilation Tendency and Present-Day Stress
- Trap Integrity Review: Overpressure, Retention Capacity and Late Tectonic Breach

Day 8: Reservoir, Charge Inputs and Probabilistic Prospect Volumetrics

- Reservoir Presence and Deliverability Factors from Porosity-Depth Analogue Trends
- Charge Access Inputs Taken from Geochemistry: Kitchen Maturity, Migration Focus and Timing
- Gross Rock Volume from Area-Depth and Area-Thickness Methods with Geometric Correction Factors
- Probabilistic Input Distributions: Lognormal Ranges, P90-P50-P10 and Input Dependencies
- Monte Carlo Volumetric Simulation and Expectation Curves for Recoverable Volumes

Day 9: Geological Chance of Success, Risk Calibration and Portfolio Ranking

- Geological Chance of Success as the Product of Independent Play and Prospect Factors
- Risk Scoring Tables and Confidence Descriptors for Consistent Chance Assignment
- Dependent Risk, Shared Play Chance and Multi-Target Prospect Aggregation
- Risk Calibration with Post-Drill Lookbacks and Predicted versus Actual Success Rates
- Expected Monetary Value, Risked Volume Ranking and Drill-or-Drop Decision Criteria

Day 10: Capstone: Risked and Ranked Prospect Portfolio for a Case Basin

- Capstone Exercise: Prospect Generation from Fairway and Structural Maps
- Capstone Exercise: Trap, Top Seal and Fault Seal Assessment for Each Prospect
- Capstone Exercise: Volumetric Ranges and Chance-of-Success Sheet per Prospect
- Capstone Exercise: Portfolio Ranking Matrix and Drilling Sequence Recommendation
- Prospect Portfolio Presentation and Peer Assurance Panel Review

Skills You Will Gain:

- Tectonic Basin Classification
- Play Fairway Mapping
- Common Risk Segment Analysis
- Structural Trap Interpretation
- Top Seal Capacity Estimation
- Fault Seal Assessment
- Probabilistic Volumetrics
- Prospect Portfolio Ranking

Why Attend This Course:

- Leave with a Risked and Ranked Prospect Portfolio built from fairway maps, trap and seal assessments and probabilistic volumes for a case basin
- Defend chance-of-success numbers at assurance panels with scoring tables and lookback evidence rather than individual judgement
- Spot trap styles, seal weaknesses and reactivation risks that single-discipline reviews tend to miss
- Compare risking practice with geologists, geophysicists and new ventures staff working rift, foreland, passive margin and salt basins

Conclusion:

Credible exploration decisions need basin setting, play fairways, trap geometry, seal behaviour, volumes and chance of success assessed as one chain. Week one moves from basin types and subsidence to play fairway and common risk segment maps, structural trap styles, restoration and fractured reservoirs, closing with a guided case. Week two adds top seal capacity, fault seal and trap integrity, probabilistic volumetrics, calibrated chance of success and portfolio ranking. The capstone produces a Risked and Ranked Prospect Portfolio ready for peer assurance.