CGG GeoSoftware Training Programs for 2017

GeoSoftware offers a comprehensive solution for your integrated geophysical, geological, petrophysical, rock physics and interpretation needs. Our extensive portfolio includes HampsonRussell, Jason, InsightEarth, PowerLog, EarthModel FT and VelPro. Our training solutions cover concepts from basic software functionality to highly integrated workflows so each student maximizes the value of the software and your company’s return on investment.

We offer four types of training programs:

- **Public Training Courses** – Instructor-led, workflow-based, classroom training covering the entire range of Petrophysics, Rock Physics, AVO, Deterministic Inversion, Geostatistical Inversion and Interpretation.

- **Customized Training Programs** – Dedicated longer term training classes, with more time for hands-on practice using clients actual study data. Test, certification and final presentation of study results to management.

- **Mentoring/Coaching Consultancy** – Using client’s data and projects within their own operating environment.

- **Work Placement Experience Programs** – Within GeoSoftware’s office for selected customer staff.

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**GeoSoftware Product Brands**
- HampsonRussell
- Jason
- InsightEarth
- PowerLog
- EarthModel FT
- VelPro

**International Training Centers**
- Abu Dhabi (UAE)
- Beijing (China)
- Calgary (Canada)
- Houston (USA)
- Jakarta (Indonesia)
- Kuala Lumpur (Malaysia)
- London (United Kingdom)
- Moscow (Russia)
- Mumbai (India)
- Perth (Australia)
- Singapore (Singapore)
- The Hague (The Netherlands)
HampsonRussell Training Courses

- HR-100 Foundations of HampsonRussell Software
- HR-210 Strata Workshop
- HR-215 MapPredict (formerly ISMap) Workshop
- HR-220 AVO Workshop
- HR-225 Seismic Lithology & AVO Workshop
- HR-230 Emerge Workshop
- HR-235 ProAZ Azimuthal Attributes Workshop
- HR-240 LithoSI Workshop
- HR-245 LithoSI & Emerge Workshop
- HR-250 Pro4D Time-Lapse Seismic Analysis Workshop
- HR-255 ProMC Multi-Component Data Analysis Workshop
- HR-260 RockSI Workshop
- HR-265 GeoSI Workshop

Jason Training Courses

- JW-000 Visualizing and Managing Data Using the Jason Workbench
- JW-100 Basic Interpretation Techniques for Seismic Inversion
- JW-101 Introduction to Acoustic Impedance Inversion
- JW-110 Introduction to Constrained Sparse Spike Inversion
- JW-120 Rock Physics for Seismic Interpretation
- JW-130 Basic RockPhysics Modeling in Largo
- JW-201 Introduction to Simultaneous Inversion
- JW-203 Anisotropic Inversion in the Jason Workbench
- JW-220 Introduction to Geostatistical Inversion
- JW-310 Deterministic Inversion – Advanced
Jason Training Courses (Continued)

- JW-320 Partial Stack Geostatistical Inversion and Advanced Workflows
- JW-420 Modeling Reservoir Properties Using Geostatistical Inversion

InsightEarth Training Courses

- IE-100 Introduction to InsightEarth
- IE-120 Structural Interpretation of Geology with InsightEarth
- IE-130 Interpretation of Depositional Systems with InsightEarth PaleoSpark
- IE-150 Solving Interpretation Problems with InsightEarth

PowerLog Training Courses

- PL-100 PowerLog Basic Training
- PL-110 PowerLogFrac
- PL-200 PowerLog Advanced Training
- PL-210 PowerLog StatMin Training
- PL-220 PowerLog Rock Physics Module for Petrophysicists
- PL-230 PowerLog Capillary Pressure Training

EarthModel FT Training Courses

- EM-100 Introduction to EarthModel FT
- EM-110 Introduction to Low Frequency Modeling using EarthModel FT
Seismic Reservoir Characterization

HampsonRussell Training Courses
Foundations of HampsonRussell Software (HRS)

Course Number: HR-100

Course overview
This course presents an introduction to the practical use of the common features of HRS, an interactive program from HampsonRussell. Topics covered include:

- Loading of logs, tops, deviated geometry, XY coordinates, horizons, 2D and 3D seismic
- Crossplotting of logs and seismic
- Arbitrary lines and area zones
- Project structure, moving and deleting of data
- Log display options and log operations

Course benefits
- Explains essential operations that are common to most HRS applications, but which are not specifically taught in the specialized classes such as Strata or AVO
- Includes Geoview, Well Explorer, eLOG, Seisloader and View3D
- Contains no geophysical theory – the theory is taught in the Strata, AVO and Emerge workshops

Software covered
HampsonRussell Software

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
½ day & 1-day versions (Full-day versions include loading data)

Format
Instructor-led, workflow-based, classroom training
Foundations of HampsonRussell Software (HR-100)
Course Outline

Introduction to HRS

Exercise 1: HRS
- Starting the software
- Setting default paths
- Finding and existing project
- Getting to know the interface
- Active logs

Exercise 2: Starting a Project
- Log import and display
- Log display templates
- Log highlight tool

Depth Time Curve

Exercise 3: Multi-well operations
- Curve Summary
- Profile mode
- Adding tops
- Culture

Seismic loading
Multiple seismic volume loading
Coordinate Scaler
Three corner point Geometry Loading

Exercise 4: 3D project
- Loading multiple wells
- XYs – pasting from a spreadsheet
- Culture loading
- Well spots – loading
- Tops for multiple wells from a spreadsheet
- Seismic – loading
- Base map and fold map
- Horizon – import
- Horizon – picking
- Zone Picking

Exercise 5: Workflows
- Explanation of tool
- Personalizing a workflow
- Running a Workflow
HampsonRussell Strata Workshop

Course Number: HR-210

Course overview
This course covers the theory and practical use of Strata, an interactive program that is fully linked within HampsonRussell software and performs pre-stack and post-stack inversion. Topics covered include:
- Introduction: Convolutional models, wavelets, reflectivity and noise
- Analysis: Seismic and wavelet processing, amplitude recover, noise attenuation and imaging
- Practical: Examples of band-limited, sparse-spike and model-based inversion
- Includes pre-stack Simultaneous Inversion

Course benefits
- Covers both pre-stack and post-stack inversion, with a largely non-mathematical overview of current seismic inversion methods
- Demystifies many of the different methods that are used today to invert seismic data
- Presentation of several applications of the seismic inversion method to various datasets from around the world
- Combination of theory and practical exercises using the Strata software. Exercises comprise approximately 50 percent of the course content
- At the conclusion of the course, participants will be better able to evaluate inversion methods and to undertake inversion projects

Software covered
Strata

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell Strata Workshop (HR-210)  
Course Outline

Introduction to Post-stack Inversion  
   Exercise 1 - Erskine: Single-well Project set up and Loading

Log Correlation and Wavelets  
   Exercise 2 - Erskine: Log Correlation and wavelets

Model Building  
   Exercise 3 - Erskine: Model Building

Model Based Inversion Technique and Analysis  
   Exercise 4 - Erskine: Inversion Analysis and Application

Review Model Based Inversion Steps  
   Exercise 5 - Blackfoot: Multi-well Project set up and Correlation

Scaling, Constraints, Error Plots and Model Enhancements  
   Exercise 6 - Blackfoot: Workflow Inversion

Post Inversion QC  
   Exercise 7 - Blackfoot: QC

Alternative Post Stack Inversion Techniques  
   Exercise 8 - Blackfoot: Alternative Inversion Methods
HampsonRussell MapPredict Workshop
(Formerly ISMap)

Course Number: HR-215

Course overview
This course covers the theory and practical use of MapPredict / ISMap, an interactive utility that is fully linked to the HRS program and performs geostatistical analysis of map data. Users will learn the basics of variogram analysis, kriging, cokriging, sequential Gaussian simulation (SGS), and multi-attribute map analysis.

Course benefits
The student will gain experience in:
- Analyzing map data for both errors and trends (histograms, crossplots, variograms)
- Producing optimal maps from sparse datasets (kriging)
- Improving the fit between two related sets of measurements about the same parameter (cokriging, KED, combining maps using Emerge)
- Simulating a number of possible maps and make quantitative predictions about their probability of occurrence (sequential Gaussian simulation)
- Creating multi-attribute map combinations using multivariate statistics

Software covered
MapPredict (formerly ISMap)

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell MapPredict Workshop (HR-215)  
Course Outline (Formerly ISMap)

Introduction
Exercise 1: Reading Data into MapPredict

Statistics of a Single Variable

Multivariate Statistics
Exercise 2: Variogram Analysis

Mapping Methods

Kriging
Exercise 3: Kriging

Incorporating a Secondary Dataset
Exercise 4: Adding Secondary Data

Case Study 1: Porosity from seismic data: A geostatistical approach

Stochastic Simulation
Exercise 5: Conditional Simulation

Depth Conversion using Geostatistics

Case Study 2: Troll Field depth conversion
Exercise 6: Depth Conversion Exercise

Combining Emerge with MapPredict
Exercise 7: Multi-linear map analysis
HampsonRussell AVO Workshop

Course Number: HR-220

Course overview
This course covers the theory and practical use of AVO, an interactive program that is fully linked within HampsonRussell software and performs Amplitude versus Offset modeling and analysis. Topics covered include:

- Introduction: Basic seismic wave principles, Poisson's ratio, gas saturation, Biot-Gassmann equations, and lithologic examples
- AVO Theory: Zoeppritz's equations, Aki-Richards and Shuey's approximation, elastic wave modeling, and impact of anisotropy
- AVO Analysis: AVO attribute volume generation and considerations, processing concerns, interpretation of AVO measurements, classification of AVO responses, AVO crossplotting and polarization, and examples from published case studies
- AVO Inversion: Simultaneous pre-stack inversion, Lambda-Mu-Rho, and elastic impedance

Course benefits

- Explains the Rock Physics framework for the study of the AVO method
- Provides a comprehensive look at the theory and application of the AVO method, a method of increasing interest to explorationists
- Introduces AVO Inversion methods: Simultaneous Inversion, LMR and EI
- Emphasizes practical AVO examples from a number of regions around the world
- Explains both the advantages and potential pitfalls of the AVO method
- Consists of both lectures and hands-on exercises, using the AVO software – the exercises comprise approximately 65% of the course
- At the end of the course, participants will be able to identify potential AVO applications in their own exploration areas and undertake AVO projects

Software covered
AVO & AFI (AVO Fluid Inversion) is not officially part of the course, but may be covered if time allows

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
HampsonRussell AVO Workshop (HR-220)
Course Outline

Day 1

Overview of the AVO process
   Exercise 1: The Colony Gas Sand – Setting up the project
Rock Physics & Fluid Replacement Modeling
   Exercise 2: The Colony Gas Sand – Biot-Gassmann analysis and RPT
AVO Theory and Zoeppritz Modeling
   Exercise 3: The Colony Gas Sand – Creating Zoeppritz Synthetics
Elastic Waves and Anisotropy
   Exercise 4: The Colony Gas Sand – Elastic wave synthetics
AVO Analysis on Seismic Data
   Exercise 5: The Colony Gas Sand – Calculating AVO Attributes
Cross Plotting AVO Attributes and the Third Order Term
   Exercise 6: The Colony Gas Sand – Cross Plotting AVO Attributes

Day 2

AVO Inversion - Elastic Impedance
   Exercise 7: The Colony Gas Sand – Extended elastic impedance
AVO Inversion - Independent AVO Inversion
AVO Inversion - Simultaneous Inversion
   Exercise 8: The Colony Gas Sand – Simultaneous Inversion
AVO Inversion - Lambda Mu Rho Theory
   Exercise 9: The Colony Gas Sand – LMR application
Processing Issues in AVO
   Exercise 10: Gulf Coast – Data Preparation
AVO Modeling Summary
   Exercise 11: Gulf Coast – AVO Modeling
AVO Inversion - Some Practical Issues
   Exercise 12: Gulf Coast – AVO Inversion
HampsonRussell Seismic Lithology & AVO Workshop

Course Number: HR-225

Course overview
This course covers the theory and practical use of Strata, AVO, Emerge, ProAZ and LithoSI, interactive programs that are fully linked within HampsonRussell Software. Topics covered include:

- Seismic Inversion - Provides a detailed overview of current seismic inversion methods
- AVO Modeling & Analysis - Provides a comprehensive look at the theory and application of the AVO method
- Seismic Attribute Analysis - Provides a comprehensive review of how to use seismic attributes to build robust relationships for prediction of petrophysical volumes
- Advanced Topics: Discusses advanced reservoir characterization methods such as stochastic and azimuthal inversions, anisotropy, fracture attributes and detection, and HRS LithoSI

Course benefits
- Covers both pre-stack and post-stack inversion
- Provides a comprehensive look at the theory and application of the AVO method
- Introduces AVO Inversion methods: Simultaneous Inversion, LMR and EI
- Explains both the advantages and potential pitfalls of the AVO method
- Application of neural network technology in well log prediction and petrophysical volume generation.
- Provides a comprehensive look at the theory and application of the AVAZ method
- Explains both the advantages and potential pitfalls of the AVAZ method
- Basic introduction to Bayesian classification, multivariate Probability Density Functions (PDFs) and their optimization, Kernel Density Estimation
- Combination of theory and practical exercises using the Strata, AVO, Emerge, ProAZ and LithoSI software
- At the conclusion of the course, participants will be better able to evaluate and undertake inversion, AVO, prediction of petrophysical volumes and lithology classification projects

Software covered
Strata, AVO, Emerge, ProAZ and LithoSI

Who should attend
Geoscientists, explorationists, and technical staff wanting to understand the theory behind essential reservoir characterization techniques and how to implement this knowledge into practical E&P project workflows

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop

Duration: 5 days

Format
Instructor-led, workflow-based, classroom training
HampsonRussell Emerge Workshop

Course Number: HR-230

Course overview
This course covers the theory and practical use of Emerge, an interactive program that is fully linked within HampsonRussell Software and performs multi-attribute seismic analysis for seismic reservoir characterization using multivariate statistics and neural networks. Topics covered include:
- Theory of seismic attributes, linear, non-linear and neural network methodologies for attribute selection, cross-validation and attribute ranking
- Application of attributes to convert seismic data volumes into geological or petrophysical volumes.
- Application of attributes to predict missing log data
- Attributes exercises using seismic data and well logs

Course benefits
- A comprehensive overview of the generation of seismic attributes
- Provides a mechanism for the user to derive complex relationships between seismic attributes and petrophysical parameters
- Understanding of how to recognize reliable attributes when estimating reservoir parameters.
- Basic theory of neural network technologies
- Application of neural network technology in well log prediction, petrophysical volume generation and seismic lithology classification
- Structured to teach theory alongside practical exercises, equipping the user in the operation of the Emerge software

Software covered
Emerge

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell Emerge Workshop (HR-230)

Course Outline

EMERGE introduction
   Exercise 1: Open a pre-loaded project

Seismic Attributes and Cross Plotting
   Exercise 2: The Single-Attribute List

Multiple Attributes and Validation
   Exercise 3: The Multi-Attribute List

Using the Convolutional Operator
   Exercise 4: The Convolutional Operator
   Exercise 5: Processing the 3D Volume

Neural Networks in EMERGE
Training the Neural Network
   Exercise 7: Porosity using PNN (Probabilistic Neural Network)

Case Study: Using Emerge to predict Vshale

Classification into facies using Neural Nets
   Exercise 8: Classification into facies using PNN

Prediction of missing logs from existing log suites
   Exercise 9: Predicting Logs from Other Logs
HampsonRussell ProAZ Azimuthal Attributes Workshop

Course Number: HR-235

Course overview
This course covers the theory and practical use of ProAZ, an interactive program that that is fully linked within HampsonRussell Software and performs Azimuthal AVO analysis and fracture analysis. Topics covered include:

- Introduction: Basic seismic wave principles, anisotropy, the relationship between fractures and anisotropy, observing anisotropy in prestack seismic data, Common Offset / Common Azimuth (COCA) Gathers
- AVAZ Modeling: Fractured rock physics, building an anisotropic model, and azimuthal convolutional modeling
- AVAZ Theory: Anisotropic Zoeppritz's equations and approximations and the impact of fractures
- AVAZ Analysis: AVAZ attribute volume generation and considerations, processing concerns, interpretation of AVAZ measurements and examples from published case studies – both the Rüger equation and Azimuthal Fourier coefficients will be discussed
- VVAZ Theory and Analysis: Azimuthal NMO and RMS velocities, azimuthal NMO corrections, inverting for interval properties using the generalized Dix equation, and examples from published case studies

Course benefits
- Explains the Rock Physics framework linking fractures and anisotropy for the study of the Amplitude versus Azimuth (AVAZ) and Velocity versus Azimuth (VVAZ)
- Provides a comprehensive look at the theory and application of the AVAZ method, a method of increasing interest with the growing importance for unconventional and fractured reservoirs
- Discussion on the similarities and differences between AVAZ and VVAZ attributes
- Emphasizes practical AVAZ and VVAZ examples from a number of regions around North America
- Explains both the advantages and potential pitfalls of the AVAZ method
- Consists of both lectures and hands-on exercises, using the ProAZ software. The exercises comprise approximately one third of the course
- At the end of the course participants will be able to identify potential AVAZ applications in their own exploration and development areas and undertake AVAZ projects

Software covered
ProAZ

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Format
Instructor-led, workflow-based, classroom training

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HampsonRussell ProAZ Azimuthal Attributes Workshop (HR-235)

Course Outline

Introduction to fracture analysis and anisotropy
   Exercise 1: Haynesville example – Setting up the project

Seismic anisotropy
   Exercise 2: Observing seismic anisotropy

Azimuthal Traveltime variations
   Exercise 3: Azimuthal Velocity Analysis

AVAz analysis & the Rüger equation
   Exercise 4: Azimuthal AVO (AVAz) analysis

Azimuthal Fourier Coefficients
   Exercise 5: Calculating Azimuthal Fourier Coefficients

Azimuthal Inversion
   Exercise 6: Rose Diagram & Visualization

Fractured rock physics and AVAz modeling
   Exercise 7: Azimuthal modeling

Acquisition and Processing considerations

Azimuthal Case Study
HampsonRussell Seismic LithoSI Workshop

Course Number: HR-240

Course overview
This course covers the theory and practical use of LithoSI, an interactive program that is fully linked within HampsonRussell Software and is used to analyze combinations of inversion results (typical pre-stack inversion results) to describe classes or lithologies. The outputs are litho-probability cubes, transforming inversion results into geological properties.

Course benefits
- Discussion of the LithoSI workflow for facies and fluid classification using multiple elastic parameters from the inversion of the seismic data
- Basic introduction to Bayesian classification, multivariate Probability Density Functions (PDFs) and their optimization through Kernel Density Estimation
- Teaches how to design complex multi-variate probability distribution functions to ensure proper classification of lithologies and accurate definition of litho-probabilities
- Shows how to understand the quantification of uncertainty in seismic lithology and fluid prediction
- Practical Exercises: Defining litho-classes, selecting attributes, optimizing PDFs, validating the results and volume application

Software covered
- LithoSI

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell Seismic LithoSI Workshop (HR-240)
Course Outline

Introduction to LithoSI
- Exercise 1: The Colony Gas Sand example – Setting up the project

Introductory theory of LithoSI
- Exercise 2: LithoLog: Creating Lithology Logs

Advanced theory of LithoSI
- Exercise 3: LithoSI analysis

Applying LithoSI
- Exercise 4: Applying LithoSI
HampsonRussell LithoSI & Emerge Workshop

Course Number: HR-245

Course overview
LithoSI is a relatively new, interactive package which complements our very successful Emerge software. Together with Emerge, they both allow the transformation of seismic volumes and/or elastic attributes (from Strata and/or AVO) to geological or reservoir properties such as facies, saturation and porosity. Note that in this one-day workshop, we will not cover all of the material in our standard LithoSI and Emerge workshop.

Course benefits
- Discussion of the LithoSI workflow for facies classification
- Basic introduction to Bayesian classification, multivariate Probability Density Functions (PDFs) and their optimization, Kernel Density Estimation (LithoSI)
- A comprehensive review of how to use seismic attributes to build robust relationships in the prediction of petrophysical well log data (Emerge)
- Teaches the theory and application of linear and multi-linear regression in well log prediction and seismic lithology classification (Emerge)
- Practical exercises comprise 65% of the unit content:
  - LithoSI: Defining litho-classes, selecting attributes, optimizing PDFs, validating the results, volume application
  - Emerge: Combining optimal attributes to predict volumes of log data from seismic, cross-validation techniques, volume application, predicting logs from logs

Software covered
- LithoSI, Emerge

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell LithoSI & Emerge Workshop (HR-245)

Course Outline

Introduction to LithoSI
   Exercise 1: The Colony Gas Sand example – Setting up the project

Introductory theory of LithoSI
   Exercise 2: LithoLog: Creating Lithology Logs

Advanced theory of LithoSI
   Exercise 3: LithoSI analysis

Applying LithoSI
   Exercise 4: Applying LithoSI

EMERGE introduction
   Exercise 5: Open a pre-loaded project

Seismic Attributes and Cross Plotting
   Exercise 6: The Single-Attribute List

Multiple Attributes and Validation
   Exercise 7: The Multi-Attribute List

Using the Convolutional Operator
   Exercise 8: The Convolutional Operator
   Exercise 9: Processing the 3D Volume

Neural Networks in Emerge

Training the Neural Network
   Exercise 10: Porosity using PNN (Probabilistic Neural Network)

Case Study: Using Emerge to predict Vshale

Classification into facies using Neural Nets
   Exercise 11: Classification into facies using PNN

Prediction of missing logs from existing log suites
   Exercise 12: Predicting Logs from Other Logs
HampsonRussell Pro4D (Time-Lapse Seismic Analysis) Workshop

Course Number: HR-250

Course overview
This course covers the theory and practical use of Pro4D, an interactive program that is fully linked within HampsonRussell Software and performs time-lapse, or 4D, modeling and analysis. Topics include:

- Time-Lapse Modeling: Log editing and synthetics, Biot-Gassmann fluid replacement modeling, Zoeppritz and elastic techniques, systematic methods and the wedge model
- Seismic Comparison, Calibration and Interpretation: Survey regridding, volume comparison using correlation, difference and cross-plotting, seismic calibration with time and phase shift, application of gain, shaping filters and simultaneous phase and time matching, cross-normalization, volumetrics and interpretation

Course benefits
- This course covers the theory behind 4D analysis: modeling reservoir changes and comparing seismic volumes
- Rock and fluid properties are discussed in detail. Practical application to modeling log data for a range of time-lapse scenarios, such as saturation or pressure changes
- Review of seismic processing • methods used to match post-stack 3D seismic cubes
- Volumetric analysis and matching mapped 4D response with known production information
- 50% of the course is in practical exercises using the PRO4D software

Software covered
PRO4D

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
HampsonRussell Pro4D (Time-Lapse Seismic Analysis) Workshop (HR-250)

Course Outline

Introduction to Time Lapse Monitoring (4D Seismic)
   Case Study introduction
   Exercise 1 – Data Management

Rock Physics and Fluid Properties for Time Lapse Seismic
   Exercise 2 – Pressure and Temperature Modeling

Pro4D Data Matching & 4D Analysis
   Exercise 3 – Survey Calibration

Time-lapse interpretation
   Exercise 6 – Interpretation Tools

Time lapse inversion with low frequency updates
   Exercise 7 – 4D inversion

Course Summary
HampsonRussell ProMC Multi-Component Data Analysis Workshop

Course Number: HR-255

Course overview
This course covers the theory and practical use of ProMC, an interactive program that is fully linked within HampsonRussell Software and performs multi-component seismic analysis and inversion. Topics covered include:
- Theory: What is MC data? Its acquisition, processing and uses
- Modeling: PP and PS synthetic generation; correlating PS synthetic and seismic data
- MC Seismic Analysis: Event and horizon matching; domain conversion (PP- or PS-time, or depth); generation of Vp/Vs volumes
- Interpretation Techniques: Mapping variations of Vp/Vs ratios for lithology identification, comparing PP and PS reflectivity for fluid identification

Course benefits overview
- Detailed, largely non-mathematical overview of current multi-component techniques.
- Highlights the benefits of MC data, such as imaging through gas clouds and improved lithology and fluid discrimination.
- Addresses the difficulties that exist in event registration (determining corresponding event on the P and PS seismic surveys) and introduces techniques to assist in this process.
- Interpretation techniques that derive new information from the MC data are discussed and illustrated through the use of the PROMC software. These techniques provide Vp/Vs ratio and difference between P and S wave reflectivity that can be directly related to lithology and fluids.
- Combination of both lectures and practical exercises, using the PROMC software. Exercises comprise 60% of the course content.
- At the end of the course, the participant will be able to undertake integrated modelling and interpretation of PS and PP data.

Software covered
ProMC

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance

Duration: 1 day

Format
Instructor-led, workflow-based, classroom training
HampsonRussell ProMC Multi-Component Data Analysis Workshop (HR-255)

Course Outline

Introduction to Multi-Component (MC) seismic data
- MC Basics
- Applications for MC seismic
- Challenges for MC Seismic
- Complications in MC interpretations
- Acquisition and processing problems

Introduction to ProMC software

Case History Introduction
- Exercise 1: Data Loading and Project Initialization

Modeling the PS seismic response
- Sources of S-wave Log information
- Estimating S-wave
- Modeling techniques for PS synthetics
- P and PS Log Correlation
- Exercise 2: Log Calibration for MC seismic and AVO Modeling

Wavelet Extraction

Log QC

Domain Conversion
- Domain Conversion in ProMC

Domain Conversion vs. Event Matching

Event Matching
- Exercise 3: Velocity Model, Horizon Picking and Matching, and Vp/Vs Determination

Interpretation issues

Joint Inversion of PP and PS Data
- Exercise 4: Strata Model, and Join inversion of PP and PS data

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HampsonRussell RockSI Workshop

Course Number: HR-260

Course overview
This course presents an introduction to the practical use of RockSI, an interactive rock physics program from HampsonRussell, as well as an overview of rock physics theory. Topics covered include:

- Introduction to rock physics and the RockSI software program
- Log analysis using RockSI
- Rock Physics Template (RPT) and Petro-Elastic Model (PEM) theory
- Facies creation using Petro-Elastic Models (PEMs)
- Uncertainty analysis using Monte Carlo simulations of PEMs
- Combining LithoSI and RockSI (Note that LithoSI is a seismic petro-facies program which is a companion program to RockSI)

Course benefits
- Explains both the theory and practice of rock physics using the RockSI (and LithoSI) modules
- Shows how RockSI is fully integrated into the HampsonRussell Geoview interface
- Teaches the user how to apply RockSI (and LithoSI) using a real North Sea oil sand example

Software covered
HampsonRussell Software

Who should attend
Geophysicists, geologists, engineers and technical staff who want to understand the theory and practice of rock physics and Petro-Elastic models and learn how to apply these increasingly critical techniques

Pre-requisite
Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance at this class

Duration
One day

Format
Instructor-led, workflow-based, classroom training
RockSI Workshop (HR-260)
Course Outline

Introduction
RockSI software overview

Part 1: Log analysis
  • Exercise 1: Log Analysis

Part 2: Rock Physics Template (RPT) Theory
  • Exercise 2: Rock Physics Templates (RPTs)

Part 3: Facies creation using Petro-Elastic Models (PEMs)
  • Exercise 3: Creation and calibration of user-defined PEMs

Part 4: Monte Carlo simulation
  • Exercise 4: Uncertainty analysis using Monte Carlo simulations

Part 5: Combining LithoSI and RockSI
  • Exercise 5: LithoSI analysis using simulated PDFs
HampsonRussell GeoSI Workshop

Course Number: HR-265

Course overview

This course presents an introduction to the practical use of GeoSI, a stochastic inversion program from HampsonRussell, as well as an overview of relevant inversion theory. Topics covered include:

- Introduction to inversion methods – deterministic and stochastic.
- Log correlation and Model Building on both seismic and stratigraphic grids
- Basic stochastic inversion theories: Sequential Gaussian Simulation, Bayesian Stochastic inversion and GeoSI inversion theory
- Correlation and Variogram modelling
- Facies classification theory
- Stochastic lithology prediction
- Stabilizing the results
- 3D visualization

Course benefits

- Explains both the theory and practice of stochastic inversion using GeoSI modules.
- Shows how GeoSI is fully integrated into the HampsonRussell Geoview interface.
- Teaches the user how to apply GeoSI using a real North Sea oil sand example.

Software covered

HampsonRussell Software

Who should attend

Geophysicists, geologists, engineers and technical staff who want to understand the theory and practice of stochastic inversion and learn how to apply these increasingly critical techniques.

Pre-requisite

Experience with HampsonRussell Software is NOT a prerequisite for this workshop, although students will become familiar with the functionality through attendance at this class.

Duration

One day.

Format

Instructor-led, workflow-based, classroom training.
GeoSI Workshop (HR-265)
Course Outline

Introduction to inversion methods

Part 1: Introduction
  • Exercise 1: Project Setup and data loading

Part 2: Log Correlation, Wavelets and Model Building
  • Exercise 2: Wavelet extraction and model building

Part 3: Stochastic Inversion
  • Exercise 3: Stochastic Inversion

Part 4: Facies Prediction
  • Exercise 4: Facies Prediction

Part 5: Visualization of results
  • Exercise 5: Visualization
Seismic Inversion

Jason Workbench
Training Courses
Visualizing and Managing Data Using the Jason Workbench

Course number: **JW-000** (Previously Jason 000)

**Course overview**
This training course enables the students to familiarize themselves with the visualization and management tools in Jason. This course is a self-study course intended to be concluded prior to attending a JW-105, JW-100 or JW-101 class.

**Course benefits**
Familiarization with the basic layout of the Jason environment and the tools for visualizing and managing data will help students focus more quickly on applying them in subsequent training courses. This course shows you how to navigate the launcher, find and display data and control and manage the contents of the various data visualization tools in the Jason launcher.

**Software covered**
- Jason Workbench

**Who should attend**
This course is recommended for students prior to attending a Jason 100 or Jason 101 class

**Pre-requisite**
None

**Duration**
4 hours self-study

**Format**
Self-Paced Tutorial
Visualizing and Managing Data Using the Jason Workbench (JW-000)

Course Outline

Chapter 1

Introduction
- Sample project
- Starting the Jason Workbench
- Understanding the Jason Workbench
- Using the Help System

Chapter 2

Exploring the Jason Viewers
- Map View
- Section View
- 3D View

Chapter 3

ViewMaster
- Using ViewMaster
- Displaying Stratigraphic Data

Chapter 4

Managing data in Jason
- Horizon Manager
- Fault Manager
- Well Manager
Basic Interpretation Techniques for Seismic Inversion

Course number: JW-100 (Previously Jason 100)

Course overview
There are many benefits to using elastic properties such as P-Impedance and Vp/Vs produced with the Jason Workbench. You will learn how to achieve:
- More accurate structural and stratigraphic interpretations
- More accurate maps and volumetrics
- Conversion of elastic properties into petrophysical reservoir properties
- A more effective drilling program based on the clearer interpretation of the reservoir
- Advanced reservoir description and characterization

This course begins with a basic introduction to elastic parameters and how to qualify and interpret the seismic inversion results. After this, discussion turns to methods for analyzing inversion results for qualitative and quantitative reservoir characterization.

Course benefits
Enhanced interpretation quality and productivity using seismic inversion data, interpretation concepts for effective analysis on seismic workstations, and more effective prospect presentations to management

Software covered
Jason Workbench

Who should attend
This course is intended for those who want to learn how to interpret and analyze inversion results

Pre-requisite
JW-000

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
Basic Interpretation Techniques for Seismic Inversion (JW-100)

Course Outline

Day 1
- Using seismic data for reservoir characterization
- CSSI introduction
- How to QC a CSSI Inversion
- How to interpret InverTracePlus results

Day 2
- Interpretation of RockTrace inversion results
- Introduction to geostatistical inversion
- Interpretation of StatMod / RockMod results
- Upscaling
Introduction to Acoustic Impedance Inversion

Course number: JW-101 (Previously Jason 101)

Course overview
You will learn the workflow and QC procedures to perform an Acoustic Impedance inversion using InverTracePlus. Through a combination of lectures and exercises on a 3D Gulf of Mexico data set, students will learn the following skills:

- How to load and QC data
- How to perform a feasibility analysis to verify that the data is suitable for this technology
- How to tie wells, build low-frequency models, and estimate multi-well wavelets
- How to select and test parameters and generate Acoustic Impedance data with InverTracePlus
- How to QC, analyze, and interpret the Acoustic Impedance data

Course benefits

- Effective and efficient use of the software
- Ability to manage and QC projects
- Understanding of methods for improved reservoir characterization

Software covered

- GeoSoftware launcher and Jason Workbench
- SEG-Y Import, Well Log Import, Well Tops Import, Horizon (ASCII) Import, Wavelets (ASCII) Import
- Map View, Section View, 3D View, Graph View, Well Log View, Well Manager, Crossplots and Histograms
- Well Editor, Wavelet Estimation, ViewMaster, BodyChecking, Attribute Estimation, Processing Toolkit, Estimate Multi-Stack Wavelets, Seismic Definition Editor
- Model Builder (without TDC), Model Generator, InverTracePlus

Who should attend
This training course is intended for people who want to start working with Jason software, or for those who want to learn more about Inversion

Pre-requisite
JW-000, GeoSoftware Integration Tutorial

Duration
3 days

Format
Instructor-led, workflow-based, classroom training
Introduction to Acoustic Impedance Inversion (JW-101)

Course Outline

Day 1
- Introduction to Acoustic Impedance Inversion
- Benefits of Acoustic Impedance Data
- InverTracePlus Workflow
- Project Setup and Data Loading
- Project Feasibility

Day 2
- Well Editor and seismic tie
- Wavelet Estimation
- Horizon Editing
- Trend and stratigraphic modeling

Day 3
- InverTracePlus (CSSI)
- QC’ing the inversion results
- Interpretation of inversion results
Introduction to Constrained Sparse Spike Inversion

Course number: JW-110

Course overview

Constrained Sparse Spike Inversion (CSSI) is a technique to invert seismic data to elastic property volumes. The Jason™ Workbench provides the RockTrace® module to perform Simultaneous AVA/AVO Inversion based on CSSI. In RockTrace, the objective is to solve for shear impedance and where possible density in addition to acoustic impedance. The resulting volumes of absolute rock properties are tightly calibrated to the well log data. These results are most commonly used to delineate lithology, porosity, fluid content and other petrophysical parameters.

This course will teach the participants to independently run the RockTrace Simultaneous Inversion software, QC, interpret and analyse the results. You will learn the workflow and QC procedures to perform an inversion using RockTrace. Through a combination of lectures and exercises on a 3D Gulf of Mexico data set, students will learn the following skills:

• How to load and QC data
• How to perform a feasibility analysis to verify that the data is suitable for this technology
• How to tie wells, build low-frequency models, and estimate multi-well wavelets
• How to select and test parameters and generate elastic property volumes with RockTrace
• How to QC the elastic property volumes
• How to interpret these volumes in terms of reservoir bodies, facies probability and net pay

Course benefits

Acquire the ability to perform Simultaneous Inversion projects with basic settings and QC analysis. Through practice and experience, students will be able to understand the inversion workflow and interpret the results. Thereby the students learn to take full advantage of RockTrace® functionalities and capabilities

Software covered

Jason Workbench; Inversion with RockTrace; Quantitative analysis with BodyChecking and Facies and Fluids Probability (FFP)

Who should attend

This training course is intended for people who want to start working with Jason software, or for those who want to learn more about Simultaneous AVO/AVA Inversion

Pre-requisite

JW-000 Visualizing and Managing Data Using the Jason Workbench and GeoSoftware Integration Tutorial

Duration

4 days

Format

Instructor-led, workflow-based, classroom training
Introduction to Constraint Sparse Spike Inversion (JW-110)

Course Outline

Day 1
- Introduction to Constrained Sparse Spike Inversion
- Deterministic Workflow
- Project Setup and Data Loading
- QC of Imported Data
- Data Alignment

Day 2
- Project Feasibility
- Well Editor and seismic tie
- Wavelet Estimation

Day 3
- Horizon Editing
- Trend and stratigraphic modeling
- Setting the RockTrace Inversion Parameters
- RockTrace Inversion on a Synthetic Dataset
- Review of Inversion Parameter Testing
- RockTrace Inversion on the Amberjack Dataset

Day 4
- QC’ing the inversion results
- Analysing and interpretation of inversion results
Rock Physics for Seismic Interpretation

Course number: JW-120 (Previously Jason 110)

Course overview
This two-day course is based on a series of lectures supported by basic exercises using the Jason Workbench running on Windows. The course is designed to provide a basic understanding of the relationships between elastic and reservoir properties of rocks, and demonstrate how rock physics is used to interpret and analyze seismic data. The course will cover the following topics:

- Seismic wave propagation
- Elastic properties of rocks
- Empirical rock physics relationships
- Numerical rock physics models
- Fluid models
- Problems of scale
- Applying rock physics to well data
- Rock physics based interpretation of seismic
- Seismic anisotropy
- Seismic attenuation

Course benefits
- Effective and efficient use of the software
- Ability to manage and QC projects
- Understanding of methods for improved reservoir characterization

Software covered
Jason Workbench

Who should attend
This course is geared towards geoscientists who wish to understand the rock physics behind reservoir characterization, reservoir delineation, hydrocarbon detection and reservoir development. It is suitable for geophysicists, geologists and petrophysicists.

Pre-requisite
None

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
Rock Physics for Seismic Interpretation (JW-120)
Course Outline

Day 1
- Elastic wave propagation
- Rock physics rules of thumb
- Elastic properties of minerals and fluids
- Empirical models
- Rock Physics models

Day 2
- Fluid models
- Scale
- Building a RP model with well data
- Interpretation
- Attenuation
- Anisotropy
- Summary
Basic Rock Physics Modeling in Largo

Course number:  JW-130  (Previously Jason 501)

Course overview
This training course gives an introduction on how to perform rock physics modeling using the Largo™ module. It also explains some basic rock physics modeling concepts. The main focus of this course is on velocity modeling for different fluids (Fluid substitution).

Course benefits
Upon completion of this course, participants will have the ability to use the different Largo sheets to manipulate well curves, to perform basic velocity modeling and fluid mixture modeling, and to QC the results.

Software covered
- Largo

Who should attend
This course is intended for people who have a geophysics background and who need to perform rock physics modeling in their seismic reservoir characterization job

Pre-requisite
- Basic understanding of rock physics
- Experience working with the Jason Workbench
- Basic knowledge of seismic reservoir characterization

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
Basic Rock Physics Modeling in Largo (JW-130)
Course Outline

AM
- Lecture: Introduction to Rock Physics
- Demo: Largo
- Exercise: Calculate categorical curve
- Lecture: Velocity Modeling
- Exercise: Shear velocity estimation

PM
- Lecture: Fluid Mixture Modeling
- Exercise: Fluid mixture modeling and parameter optimization
- Lecture: Fluid Substitution and Gassmann
- Exercise: Fluid substitution
Introduction to Simultaneous Inversion

Course number: JW-201 (Previously Jason 201)

Course overview

Seismic data responds to both the acoustic impedance and the shear impedance contrasts in the subsurface. This additional information within the seismic data can be exploited using the variation in seismic reflection amplitude with angle or offset.

Jason’s Simultaneous Inversion overcomes most of the disadvantages of standard AVO analysis and integrates the best of inversion while exploiting the full information within the seismic data. RockTrace is the module within the Jason Workbench that performs simultaneous inversion.

RockTrace builds on Jason’s InverTracePlus full stack inversion technology by extending it to the AVO domain. The result is three volumes of absolute rock properties tightly calibrated to the well log data: P-impedance, S-impedance and Density. These results are most commonly used to delineate lithology, porosity, fluid content and other petrophysical parameters.

This course will teach the participants to independently run the RockTrace Simultaneous Inversion software, QC, interpret and analyze the results.

Course benefits

Acquire the ability to perform Simultaneous Inversion projects with basic settings and QC analysis. Through practice and experience, you will be able to understand and take full advantage of RockTrace functionalities and capabilities

Software covered

Map View, Section View, Well Log View, 3D View, Crossplots and Histograms, Well Editor, Well Manage, Horizon Manager, Model Builder (without TDC), Data Attributes Editor, FunctionMod, Attributes Estimation, Processing Toolkit, BodyChecking, Facies and Fluid Probabilities, Horizon Alignment, Volume Alignment, Multiple Volume Alignment

Who should attend

This training course is intended for people who have experience with acoustic impedance inversion projects and need to learn more about simultaneous inversion

Pre-requisite

Introduction to Acoustic Impedance Inversion (JW-101)

Duration

4 days

Format

Instructor-led, workflow-based, classroom training
Introduction to Simultaneous Inversion (JW-201)

Course Outline

Day 1
- Introduction to simultaneous inversion
- RockTrace workflow
- Introduction to the datasets
- Data Loading QC
- QC Input Well Logs
- Data Alignment

Day 2
- Project Feasibility
- Wavelet Estimation and Well Tie
- Low Frequency Modeling

Day 3
- Setting the Inversion Parameters
- Inversion on a Synthetic Dataset
- Review of Inversion Parameter Testing
- Inversion on the Amberjack Dataset
- Technical Background on RockTrace Inversion

Day 4
- QC Inversion Results
- Analysis of Inversion Results
- Course review
Anisotropic Inversion in the Jason Workbench

Course number: JW-203

Course overview
CGG has a novel patented method to calculate effective elastic parameters in a variety of anisotropic media. These effective elastic parameters allow you to use isotropic modeling and inversion in an anisotropic environment. You can use existing tools such for Well Tying, Wavelet Estimation and Pre-stack Inversion in a quantitative manner.

This course uses a synthetic Wide Azimuth (WAZ) data set that contains several HTI (Azimuthal Anisotropy) features. On these data several hands-on exercises are offered to acquaint yourself with the available HTI-related functionality in the Jason Workbench:
- Loading and viewing WAZ data
- Calculating the expected anisotropy
- Calculating and analyzing the effective elastic parameters
- Creating azimuthally-sectored synthetics
- Inverting and analyzing azimuthally-sectored seismic data
- Updating the Azimuthal Low Frequency Model (ALFM)

Course benefits
You will acquire the ability to perform Simultaneous Inversion projects on azimuthally-sectored seismic data. Through practice and experience, you will be able to understand the Azimuthal Inversion workflow and interpret its results. In doing so, you will learn to take full advantage of Jason’s HTI-related functionality and capabilities.

Software covered
Jason Workbench: SEG-Y loader, FunctionMod, CoCa View, Elastic Volumes Evaluator, Synthetics Toolbox, Inversion with RockTrace®

Who should attend
This training course is intended for experienced RockTrace people who want to invert WAZ seismic data in a quantitative manner, or for those who want to learn more about Azimuthal Inversion.

Pre-requisite
You will gain the most from this course if you are experienced in running Jason’s pre-stack inversion tool (RockTrace®) or completed JW-110 Introduction to Constrained Sparse Spike Inversion or JW-201 Introduction to Simultaneous Inversion.

Duration
1 day

Format
Instructor-led.
Anisotropic Inversion in the Jason Workbench (JW-203)

Course Outline

Day 1

- Introduction
- The Data
- Exercise 1: Loading and Inspecting the Seismic Azimuthal Data
- Exercise 2: Calculating the Expected Anisotropy
- Exercise 3: Calculating and Analysing the Effective Elastic Parameters
- Exercise 4: Making Synthetics
- Exercise 5: Sectored Inversion
- Exercise 6: Updating the Azimuthal Low Frequency Model
- Making the Anisotropic Model
Introduction to Geostatistical Inversion

Course number: JW-220 (Previously Jason 301)

Course overview
This course covers the basic theoretical concepts and software components necessary to perform geostatistical inversion in the Jason Workbench. Since knowledge of various geostatistical principles such as multivariate distributions and variograms is necessary, pertinent introductions to these topics are included in the course lectures.

Course benefits
Upon completion of this course, participants will have the ability to run basic StatMod® projects, in conjunction with other modules of the Jason Workbench, to perform geostatistical inversion, QC the parameters and analyze the results with minimal expert supervision.

Software covered
- StatMod

Who should attend
This course is intended for those who want to learn to perform geostatistical inversion using StatMod.

Pre-requisite
- Introduction to Acoustic Impedance Inversion (JW-101)
- Experience performing inversion projects

Duration
4 days

Format
Instructor-led, workflow-based, classroom training
Introduction to Geostatistical Inversion (JW-220)

Course Outline

Day 1
- Course Introduction
- Lecture: Overview of Geostatistics
- Lecture: Introduction to StatMod
- Lecture: StatMod Workflow
- Lecture: Data Conditioning
- Exercise: Prepare the Project
- Lecture and Exercise: Discrete Properties

Day 2
- Lecture and Exercise: Statistical Modeling
- Lecture: Variograms
- Exercise: Variogram Modeling
- Lecture: QC & Analysis of Simulation Results
- Exercise: Simulation
- Lecture: Inversion Parameter Settings and QC (beginning)
- Exercise: Seismic Noise Level Testing (beginning)

Day 3
- Lecture: Inversion Parameter Settings and QC (continuation)
- Exercise: Seismic Noise Level Testing (continuation)
- Lecture and Exercise: Basic Proportion Trends
- Exercise: Inversion with Favorite Settings
- Lecture and Exercise: Uncertainty

Day 4
- Lecture and Exercise: Cosimulation
- Lecture and Exercise: Ranking
- Lecture: Concluding remarks
Deterministic Inversion – Advanced

Course number: **JW-310** (Previously Jason 202)

**Course overview**
The advanced course for deterministic inversion captures different techniques that can be added to and used as part of the standard CSSI workflow. The proposed methods are recommended in cases where the results of the conventional approach are not satisfactory. The course material is divided into several stand-alone modules. Each module focuses on a technique or a specific Jason tool and explains the background of the technique or tool and advises on how to use them in specific cases.

Course modules include:
- AVO Attribute Extraction—provides instruction on classification of AVO responses based on the present lithology and type of substituting fluid
- Multi-Attribute Well Interpolator —provides instruction on how to apply attribute-guided well log interpolation in Jason
- LFM Trend Update—provides instruction on the role the low frequency model plays in deterministic inversion. This is demonstrated on a simple Wedge model
- 4D Inversion—consists of lectures on workflow for performing 4D deterministic inversion, how to generate time-lapse synthetic data, assessing technical risks and using inverted 4D parameters to map different production effects
- Wavelet Variations—provides instruction on how to measure the effect of Q attenuation and to compensate for it during deterministic inversion
- Spectral Decomposition—provides instruction on the basics of spectral decomposition and how to perform in Jason

**Course benefits**
- Knowledge of how to use some of the more advanced techniques with the Jason software
- More flexibility in solving problems in deterministic inversion projects

**Software covered**
Map View, Section View, Well Editor (AVO/AVA), Crossplots and Histograms, AVO Attribute Extraction, Attribute Estimation, ViewMaster, FunctionMod, Horizon Manager, InverTracePlus, Multi-Attribute Well Interpolator, Graph View, Well Manager, WaveletTools, Processing Toolkit, File Manager, InverTrace® Plus

**Who should attend**
This training course is intended for people who already have gained experience with Jason’s deterministic inversion projects and need to work on more complex projects

**Pre-requisite**
- Introduction to Simultaneous Inversion (JW-201)
- Knowledge of modeling with EarthModel® FT
- Working experience with Jason and performing deterministic inversion projects

**Duration**
3 days

**Format**
Instructor-led, workflow-based, classroom training
Deterministic Inversion – Advanced (JW-310)
Course Outline

Day 1
- Multi-Attribute Well Interpolator
- LFM Trend Update

Day 2
- AVO Attribute Extraction
- Spectral Decomposition

Day 3
- Wavelet Variations
- 4D Inversion
Partial Stack Geostatistical Inversion and Advanced Workflows

Course number:  JW-320 (Previously Jason 401)

Course overview
Students will learn to independently run the RockMod® Partial Stack Geostatistical Inversion software, QC, interpret and analyze the results. Advanced options are also presented in lectures and exercises, such as incorporating geological trends and taking into account spatially-varying seismic quality. At the beginning of this course, the geostatistical inversion workflow steps are recalled. Exercises follow to introduce the students to using RockMod, the partial stack geostatistical inversion module of Jason. Emphasize is set on QC’ing and analyzing the results. The last part is focused on including large-scale geological trends and spatially-varying seismic data quality in the inversion.

Course benefits
Upon completion of this course, participants will have the ability to run basic RockMod projects, in conjunction with other modules of Jason, to perform partial stack geostatistical inversion, QC the parameters and analyze the results with minimal expert supervision.

Software covered
RockMod

Who should attend
This course is intended for those who want to learn to perform geostatistical inversion using RockMod.

Pre-requisite
- Introduction to Simultaneous Inversion (JW-201)
- Introduction to Geostatistical Inversion (JW-220)
- Experience performing (partial stack) inversion projects in Jason

Duration
1 day

Format
Instructor-led, workflow-based, classroom training
Partial Stack Geostatistical Inversion and Advanced Workflows (JW-320)

Course Outline

Day 1

- Course Introduction
- Lecture: Geostatistical inversion workflow (recall)
- Exercise: Project start-up meeting
- Exercise: Running a basic RockMod inversion
- Lecture and Exercise: Dealing with large-scale spatial trends
- Lecture and Exercise: Accounting for variations in seismic quality
- Review
Modeling Reservoir Properties Using Geostatistical Inversion

Course number JW-420 (Previously Jason 402)

Course overview
Students will learn how to run RockMod Partial Stack Geostatistical Inversion to generate engineering properties for subsequent usage in flow simulation. Special emphasis is placed on integrating more geological constraints into reservoir models, particularly in terms of imposing prior facies distributions and including rock physics models to link engineering properties to seismic data. The course begins with an overview of geostatistical inversion in the context of geocellular grids and then proceeds with lectures and exercises on modeling geological trends and fluid contacts, inverting directly for engineering properties and enhancing prior information with statistical rock physics. The course concludes with transferring and upscaling engineering properties onto a geocellular grid required for flow simulation.

Course benefits
Upon completion of this course, participants will have a grasp of the key aspects of the workflow required for generating seismically-constrained engineering properties on a geocellular grid using RockMod. Participants will be able to use advanced features of the software to integrate key components of geology, geophysics, rock physics and reservoir engineering into reservoir models.

Software covered
RockMod

Who should attend
This course is intended for those who want to learn advanced geostatistical inversion techniques.

Pre-requisites
• Introduction to Simultaneous Inversion (JW-201)
• Introduction to Geostatistical Inversion (JW-220)
• Partial Stack Geostatistical Inversion and Advanced Workflows (JW-320)
• Experience performing (partial stack) inversion projects in Jason

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
Modeling Reservoir Properties Using Geostatistical Inversion (JW-420)

Course Outline

Day 1
- Course Introduction
- Lecture: Geostatistical inversion for flow simulation
- Lecture: Advanced facies modeling
- Exercise: Project Start-Up
- Exercise: Modeling fluid contacts
- Exercise: Modeling stratigraphic trends

Day 2
- Lecture: Geostatistical inversion of engineering properties
- Exercise: Inversion with arithmetic expressions
- Exercise: Inversion with rock physics model
- Lecture: Enhancing prior pdfs with statistical rock physics
- Exercise: Application of statistical rock physics
- Lecture: Geostatistical inversion properties on CPGs
- Exercise: Delivering RockMod Properties on a CPG
- Lecture: Review
Advanced Interpretation

InsightEarth
Training Courses
Introduction to InsightEarth

Course Number: IE-100 (Previously TS-100)

Course overview
Upon successful completion of this course students will be able to apply the tools available within InsightEarth® to:

- Understand the advantages of using InsightEarth’s 3D interpretation technology
- Proficiently navigate the intuitive user interface within InsightEarth
- Successfully condition data for structure and stratigraphy
- Effectively accomplish selected interpretation goals using the workflow guide
- Easily import and export files from/to InsightEarth
- Effectively use InsightEarth help

Course benefit
This course is intended to provide Geoscientists and Geotechnicians with an understanding of the data and visualization management tools within InsightEarth Ignition

Software covered
InsightEarth Ignition

Who should attend
Geoscientists and Geotechnicians familiar with seismic interpretation and new to InsightEarth

Prerequisites
Geosciences background recommended but not required

Duration
4 Hours (1/2 day)

Format
Instructor-led, workflow-based, classroom training
Introduction to InsightEarth (IE-100)

Course Outline

4 Hours

- InsightEarth Overview
  - InsightEarth’s approach to 3D Interpretation
- System Overview - Demonstration & student lab
  - The Importance of Data Conditioning
  - Workflow Guide - Demonstration & student lab
  - Data Conditioning - Demonstration & student lab
- Importing Files Into and Exporting Files from InsightEarth – Demonstration & student lab
  - Additional Student Resources
Structural Interpretation of Geology with InsightEarth

Course number: IE-120 (Previously TS-200)

Course overview
This course is intended to provide geoscientists the skills necessary to apply InsightEarth in a structured workflow to interpret structure in a 3D seismic volume

Course benefit
Upon successful completion of this course students will be able to apply the tools available within InsightEarth to:

- Understand the advantages of using InsightEarth's 3D interpretation technology
- Effectively accomplish interpretation goals using the workflow guide
- Rapidly construct 3D structural models of salt bodies, faults and horizons in seismic volumes
- Efficiently apply InsightEarth technology including Surface Wrapping, Automated Fault Extraction and Autotracking using multiple stopping conditions
- Accurately Q/C and refine structural interpretations

Software covered
- InsightEarth FaultFractureSpark
- InsightEarth SaltSpark

Who should attend
Geoscientists familiar with seismic interpretation and new to InsightEarth

Pre-requisite
IE-100 Introduction to InsightEarth

Duration
1.5 days

Format
Instructor-led, workflow-based, classroom training
Structural Interpretation of Geology with InsightEarth (IE-120)  
Course Outline

Day 1
AM  
IE-100
Note that this course is preceded by IE-100 Introduction to InsightEarth

Day 1
PM  
IE-120 Begins  
• Structural Interpretation Overview  
• Seismic Preparation for Geobody Interpretation - Demonstration & student lab  
• Imaging Salt Bodies Using SaltSpark - Demonstration & student lab

Day 2
AM  
IE-120 Continues  
• Interpreting Salt Bodies Using SaltSpark - Demonstration & student lab  
• Imaging Faults using FaultFractureSpark - Demonstration & student lab

Day 2
PM  
IE-120 Concludes  
• Interpreting Faults using FaultFractureSpark - Demonstration & student lab  
• Imaging & Interpreting Horizons using FaultFractureSpark Demonstration & student lab
Interpretation of Depositional Systems with InsightEarth
PaleoSpark

Course number: IE-130 (Previously TS-300)

Course overview
Upon successful completion of this course students will be able to apply the tools available within InsightEarth to:
- Understand the advantages of using InsightEarth’s 3D interpretation technology
- Apply domain transformation concepts to more rapidly recognize depositional features
- Efficiently convert a time/depth domain volume to the stratal domain
- Rapidly create 3D volume of depositional surfaces
- Realistically image, interpret and analyse stratigraphic features in the stratal domain
- Convert stratal domain interpretation back to the time/depth domain

Course benefit
This course is intended to provide geoscientists the skills necessary to apply InsightEarth in a structured workflow to interpret stratigraphy in a 3D seismic volume

Software Covered
InsightEarth PaleoSpark

Who should attend
Geoscientists familiar with seismic interpretation and new to InsightEarth

Prerequisites
- IE-100 Introduction to InsightEarth
- IE-120 Interpretation of Structural Geology with InsightEarth

Duration
1 Day

Format
Instructor-led, workflow-based, classroom training
Interpretation of Depositional Systems with InsightEarth
PaleoSpark (IE-130)
Course Outline

Day 1
AM
• PaleoSpark Overview
• Stratal Transform - Converting Time/Depth Domain Volume to the Stratal Domain – demonstration and student lab
• Stratal Imaging and Analyses - Highlighting stratigraphic features in the stratal volume using attributes – demonstration and student lab
• Interpretation in the Stratal Domain – demonstration and student lab

Day 1
PM
• Convert Stratal-domain Interpretation back to the Time/Depth Domain – student lab
• Stratal Slice Horizon Generation – student lab
• Autotracking Stratal Horizons – student lab
• Domain Transformation Applications
• Channel Challenge
Solving Interpretation Problems with InsightEarth

Course number: IE-150 (Previously TS-350)

Course overview
This course is the combination of the IE-100, IE-120, and IE-130 courses. Upon successful completion of this course students will be able to apply the tools available within InsightEarth to:

- Understand the advantages of using InsightEarth’s 3D interpretation technology
- Efficiently navigate the intuitive user interface within InsightEarth
- Easily import and export files from/to InsightEarth
- Effectively accomplish interpretation goals using the workflow guide
- Rapidly construct 3D structural models of salt bodies, faults and horizons in seismic volumes
- Efficiently apply InsightEarth technology including Surface Wrapping, Automated Fault Extraction, Autotracking using multiple stopping conditions and domain transformation
- Accurately Q/C and refine structural interpretations
- Apply domain transformation concepts to more rapidly recognize depositional features
- Efficiently convert a time/depth domain volume to the stratal domain
- Rapidly create 3D volume of depositional surfaces
- Realistically image, interpret and analyze stratigraphic features in the stratal domain
- Convert stratal domain interpretation back to the time/depth domain

Course benefit
This course is intended to provide geoscientists with an advanced understanding of the benefits of InsightEarth’s 3D interpretation technology, and the skills necessary to apply InsightEarth in a structured workflow to interpret structure and stratigraphy in a 3D seismic volume

Software covered
InsightEarth Ignition, InsightEarth FaultFractureSpark, InsightEarth SaltSpark, InsightEarth PaleoSpark

Who should attend?
Geoscientists familiar with seismic interpretation and new to InsightEarth

Prerequisites
Geosciences background recommended but not required

Duration
3 Days

Format
Instructor-led, workflow-based, classroom training
Solving Interpretation Problems with InsightEarth (IE-150)

Course Outline

Day 1
AM  
IE-100
•  InsightEarth Overview
•  InsightEarth’s approach to 3D Interpretation
•  System Overview – demonstration and student lab
•  The Importance of Data Conditioning
•  Workflow Guide – demonstration and student lab
•  Data Conditioning – demonstration and student lab
•  Importing Files Into and Exporting Files from InsightEarth – demonstration and student lab
•  Additional Student Resources

Day 1
PM  
IE-120 Begins
•  Structural Interpretation Overview
•  Seismic Preparation for Geobody Interpretation – demonstration and student lab
•  Imaging Salt Bodies Using SaltSpark – demonstration and student lab

Day 2
IE-120 Continues
•  Interpreting Salt Bodies Using SaltSpark – demonstration and student lab
•  Imaging Faults using FaultFractureSpark – demonstration and student lab
•  Interpreting Faults using FaultFractureSpark – demonstration and student lab
•  Imaging & Interpreting Horizons using FaultFractureSpark – demonstration and student lab

Day 3
IE-130
•  PaleoSpark Overview
•  Stratal Transform - Converting Time/Depth Domain Volume to the Stratal Domain – demonstration and student lab
•  Stratal Imaging and Analyses - Highlighting stratigraphic features in the stratal volume using attributes – demonstration and student lab
•  Interpretation in the Stratal Domain – demonstration and student lab
•  Convert Stratal-domain Interpretation back to the Time/Depth Domain – student lab
•  Stratal Slice Horizon Generation – student lab
•  Autotracking Stratal Horizons – student lab
•  Domain Transformation Applications

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Petrophysics and Rock Physics

PowerLog
Training Courses
PowerLog Basic Training

Course number: PL-100

Course overview
This course introduces you to PowerLog’s extensive capabilities and easy-to-use interface. Through a series of hands-on exercises, you learn to use the PowerLog viewers and computation modules as you follow a typical petrophysical workflow.

Course benefits
Upon completion of this course, you will be able to take full advantage of PowerLog®. You will be able to use the software more efficiently so you can perform your log analysis more quickly and with confidence in the results.

Software covered
PowerLog

Who should attend
This course is intended for anyone who is new to PowerLog or who wants to gain a greater command of the program basics.

Pre-requisite
None

Duration
3 days

Format
Instructor-led, workflow-based, classroom training
PowerLog Basic Training (PL-100)
Course Outline

Day 1
- PowerLog Administration
  - Using your Database to its full potential
- PowerLog Overview
  - The main features of PowerLog as an overview. How to use your main windows
- Tools
  - Common tools for anyone to use.
  - Alias Table
  - Screens
- Loading Data
  - All the forms of loading data in PowerLog
- Viewing Data in Logplot
  - All of your tools within PowerLog Logplot

Day 2:
- Viewing and Editing Curve Data
  - Tabular Listing
  - Mathpack
  - Basic Log Functions
- Computing True Vertical Depth
- Working with Tops and Zones
  - How to create and manipulate tops & zones
- Editing Log Curves
  - Basic curve editing tools of PowerLog
- Preparing Data for Interpretation
  - Neutron Matrix Conversion
  - Crossplots & Histograms

Day 3
- Sample Highlighting
- Interpreting Data
  - Pickett crossplots
  - QuickLook
  - Methods of computing Water Saturation
- Quality Checking the New Curves
- Creating a Collage
- Presenting Your Data
  - Exporting data and creating reports
PowerLogFrac

Course number: PL-110

Course overview
PowerLogFrac offers robust tools for on-the-spot analysis of your fracking projects. This three-day course is intended to introduce the completion engineer or other interested parties to basic petrophysical analysis and interpretation along with the determination of the rock and fluid properties needed for fracture stimulation.

Course benefits
The first two days will cover basic petrophysical concepts and methods like data loading, log editing, depth shifting, and computation of water saturation and porosity using PowerLog. The final day will cover the generation of rock and fluid properties using FracRAT and the techniques of exporting these properties in customized formats for use in commercial fracture simulation packages.

Topics Include:
- Basic petrophysical workflows for engineers
- Hands on experience with the new Zone Average Calculator (ZAC)
- Determine rock and fluid properties needed for fracture simulation
- QC results for on-the-fly error checking
- Quickly export results for easy integration into fracture modeling platforms

Software covered
- PowerLogFrac
- FracRAT

Who should attend
This course is intended for Completions engineers and new PowerLog users interested in fracture modeling

Pre-requisite
None

Duration
3 days

Format
Instructor-led, workflow-based, classroom training
PowerLogFrac (PL-110)
Course Outline

Day 1

Course Introduction
Lecture & Exercises: Overview of PowerLog
Lecture & Exercises: Loading Log Data
Lecture & Exercises: QC'ing Data in Logplot
Lecture & Exercises: Editing with Tabular Listing
Lecture & Exercises: Computing True Vertical Depth in PowerLog
Lecture & Exercises: Tops & Zones in PowerLog

Day 2

Lecture & Exercises: Preparing Data for interpretation
Lecture & Exercises: Interpreting your Data with PowerLog
Lecture & Exercises: Running User Programs
Lecture & Exercises: Calculating Clay Volume
Lecture & Exercises: PowerLog Administration
PowerLog Advanced Training

Course number: PL-200

Course overview
This two-day course focuses on the advanced tools in PowerLog for petrophysical editing, computation, and interpretation. Techniques involving multi-well computations are emphasized. You’ll gain hands-on experience through a series of guided exercises and then apply what you have learned in an independent workshop.
Specific topics are:
- Splicing, baseline shifting, and patching curves
- Applying environmental corrections
- Interactive parameter picking
- Writing and running your own programs
- Generating synthetic curves
- Normalizing curves in Multiwell Histogram
- Composing image logs and picking dips
- Generating synthetic curves
- Using PowerBatch
- MultiMin/Complex Lithology analysis
- Creating a model in EarthModel Builder
- Demo using GeoSoftware Launcher, PowerLog Enterprise, and EarthModel FT

Course benefits
Know when and how to use the more sophisticated tools offered by PowerLog, and gain confidence and flexibility to handle complex interpretation projects

Software covered
- PowerLog

Who should attend
This course is intended for experienced PowerLog users who want to apply PowerLog’s more sophisticated tools to complex interpretation projects

Pre-requisite
PowerLog: Basic Training or experience using PowerLog

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
PowerLog Advanced Training (PL-200)
Course Outline

Day 1:
- Overview the recent changes in PowerLog. Import a database and perform data quality checks in several viewers. View curve alias, well header, and logging data.
- Edit log curves by using the Splice and Baseline Shift modes in Logplot.
- Apply environmental corrections to bit size and mud weight curves you create in MathPack and by using several Logplot.
- Patch techniques. Use the Neutron Matrix Conversion module to convert a matrix from quartz to limestone, then compare the results in crossplots.
- Use the Interactive Parameter Picker to create zone parameters you can use to facilitate computation and viewer setup. Calculate more parameters in a Summation/Sensitivity report.
- Examine the sample user programs, write a program to compute temperature and pressure curves, then run the program.
- Use the Synthetic Curve Generator to create a synthetic density log for a well whose density log is affected by washouts. Calculate a model, generate the curve, refine the model, edit the curve and splice the curve.
- Work with multiwell crossplots and histograms to interpret gamma ray, density, neutron, resistivity, and acoustic curves.
- Normalize the curves you created earlier, using interactive and automated normalization. Compare the original and normalized curves in multiwell crossplots.

Day 2:
- In the Compose Image Logs module, create a borehole 2D image log that is suitable for interpretation and dip analysis. Display the image log in Logplot, pick dips on it, add and edit sine waves, and display the dipmeter curve as tadpoles and rose plots.
- Calculate clay volume in the Clay Volume module. Pick clean and shale trends by using Trend mode in Logplot, then calculate clay volume again with the trend curves as inputs.
- Analyze data in the MultiMin/Complex Lithology module. Run computations in several modules to get input values, then generate curves in MultiMin. Change the settings in the other modules to refine the inputs and observe the effects in MultiMinproduced curves.
- Set up the data for pore pressure analysis in well shale formations, watching the results in Logplot as you generate Athy compaction curves, a shale indicator flag, a composite density curve, hydrostatic and overburden pressure curves, Eaton pore pressure curves, and fracture pressure curves.
- Use PowerBatch to create and run a well-designed batch processing script, including steps for computation modules and data display in viewers with screen overrides.
- In a workshop, use your new command of PowerLog to perform a petrophysical analysis of a new well, using many modules and techniques in the process.
- Watch how quickly you can create a model of rock properties in EarthModel FT, a sibling application to PowerLog Enterprise. When input data changes, the model & computed volumetrics update automatically.
PowerLog StatMin Training

Course number: PL-210

Course overview
StatMin™ is a statistical program that calculates lithology, mineralogy, and porosity. It is especially useful for modeling complex environments such as those containing sandstones of various mineralogies or carbonate environments in general. In this two-day course, the theory and principles behind StatMin are discussed first; then students set up and run StatMin jobs for two wells. Some of the key topics covered are:

- Mathematical foundation of statistical log analysis
- Over determined, balanced, and underdetermined systems
- How StatMin computes PHIE, PHIT, Vshale, Vclay, and Sw
- Iteration in StatMin
- Advantage of using linear log responses as inputs
- Using the Compute Endpoints module to obtain linear endpoint curves from nonlinear logs
- Defining prior, main, and alternate matrices for StatMin
- Evaluating the model by comparing the original input curves and the reconstructed curves output by StatMin
- Evaluating the output volume curves in PowerLog

Course benefits
Delineate formation components in complex environments quickly and reliability, using statistical log analysis, an iterative approach, and alternative models

Software covered
- PowerLog
- StatMin

Who should attend
This course is intended for experienced PowerLog users who need to delineate formation components in complex environments quickly and reliability, using statistical log analysis

Pre-requisite
PL-200 PowerLog: Advanced Training or extensive experience using PowerLog

Duration
2 days

Format
Instructor-led, workflow-based, classroom training
PowerLog: StatMin Training (PL-210)
Course Outline

Day 1:
- Overview
- Principles
- How to use StatMin
- Guidelines & Tips
- Exercises

Day 2:
- Continue with exercises (two different datasets)
PowerLog Rock Physics Module for Petrophysicists

Course number: PL-220

Course overview
Rock Physics Module (RPM) is a calculation engine for computing rock physics models. It works in conjunction with PowerLog, using log curves from a PowerLog well as input and generating output curves that are written back to the PowerLog project. This two-day course is designed to teach you to use Rock Physics Module (RPM) effectively through hands-on experience. After a brief discussion of the kinds of petrophysical analysis needed to prepare input data for rock physics modeling, you will build a simple model (that is, an RPM workflow or directed graph). While continually checking the output in PowerLog, you will use a variety of strategies to refine the model. Key topics include:
- Conventional petrophysics vs. seismic petrophysics
- Integrating petrophysics and rock physics
- Building a simple RPM workflow (model)
- Checking the RPM results in PowerLog
- Using a predefined workflow to assess the error in the model and crossplots to identify the source of the error
- Applying various strategies to refine the model, including curve fitting and parameter tuning to determine optimal settings for input parameters
- Using predefined workflows to calculate bulk density, compressional velocity, shear velocity, fluid properties, and Gassmann fluid substitution
- Calculating a workflow for multiple wells and zones
- Customizing the display and printing workflows

Course benefits
A rock physics model is your key to integrating petrophysical data and seismic data to arrive at a consistent inversion and accurate rock property volumes. It also enables you to combine petrophysical data, core data, and reservoir data to generate rock mechanical properties for applications such as fracturing design and sanding analysis.

Software covered
- PowerLog
- Rock Physics Module (RPM)

Who should attend
This course is intended for advanced PowerLog users who want to effectively use RPM.

Pre-requisite
PL-200 PowerLog: Advanced Training or extensive experience using PowerLog

Duration
2-days

Format
Instructor-led, workflow-based, classroom training
PowerLog: Rock Physics Module Training (PL-220)

Course Outline

Day 1:
- Introduction to PowerLog and seismic Petrophysics
- Introduction to Rock Physics Module™
- Building and refining a Simple Workflow

Day 2:
- Performing Rock Physics Analysis and Modelling
- Using predefined Workflows in Rock Physics Module
- Rock Physics Module tools
PowerLog: Capillary Pressure Training

Course number: PL-230

Course overview
This is a 2-day course that teaches students how to build a saturation model for calculating water saturation based only on porosity, permeability and height above free water level using Capillary Pressure data. The students learn how to load capillary pressure data, convert laboratory measurements to equivalent reservoir properties, correct the data for reservoir conditions, compute J-functions, and construct models of saturation vs pressure and saturation vs height.

Course benefits
The student will learn how to use the Capillary Pressure Module in PowerLog.

Upon completion of this course, participants will be familiar with loading capillary pressure data, converting laboratory measurements to equivalent reservoir properties, correcting the data and construct and apply capillary pressure models to build reservoir saturation models.

Software covered
- PowerLog
- Capillary Pressure Importer
- Capillary Pressure Module

Who should attend
Petrophysicists

Pre-requisite
PL-100 PowerLog Basic training course is a prerequisite. Also, some background experience is required on Petrophysics and Capillary Pressure

Duration
2-day course

Format
Instructor-led, workflow-based, classroom training
PowerLog: Capillary Pressure Training (PL-230)
Course Outline

Day 1
- Introduction to the workflow
- Loading Capillary Pressure Data obtained by mercury injection, centrifuge or porous plate methods
- Generating Capillary Pressure Attributes
- Correcting Borehole Conditions

Day 2
- Building the Capillary Pressure Model
- Apply the Capillary Pressure Model

Day 3
- Lecture & Exercises: Calculating Volume Shale for Fracking
- Lecture & Exercises: ZACing our Wells
- Lecture & Exercises: Running FracRAT
- Lecture & Exercises: Exporting from FracRAT
Geological Modeling

EarthModel FT Training Courses
Introduction to EarthModel FT

Course number: EM-100

Course overview
This introductory EarthModel® FT course includes background information and specific examples to help you learn the philosophy and functions of the software. EarthModel FT is a powerful, flexible, and fully integrated geological reservoir modeling and visualization software package. With it, you can build an accurate and consistent model that incorporates mapping and seismic information and geological and petrophysical interpretation. The model can then be used with a flow simulator, well path engineering software, or seismic inversion projects with low frequency models.

EarthModel FT has tools to perform the following tasks:
• Basic user interface introduction
• Structural modeling including building the fault framework
• Building the 3D grid mesh
• Lithology and facies interpretation
• Deterministic & stochastic modeling, including Sequential Indicator Simulation and Sequential Gaussian Simulation

Course benefits
• Understand how to load and quality control the data
• Build complex structural and 3d models grids
• Use or processes and assistants to rapidly build a model
• How to do property modeling for use in volume computations

Software covered
EarthModel FT

Who should attend
New EarthModel FT users that need to construct 3d models and properties

Pre-requisite
Basic knowledge about geologic modeling

Duration
3-days

Format
Instructor-led, workflow-based, classroom training
Introduction to EarthModel FT
Course Outline (EM-100)

Day 1  The Basics & Surface Modeling
- Modeling approach and user interface
- Using the viewers
- Loading data and data organization
- Workflows and creating surfaces

Day 2  Sealed Framework & 3D Grid Mesh
- Assistants & creating a sealed framework
- Editing data
- Creating a grid mesh
- Mesh QC

Day 3  Property Modeling & QC
- Variogram modeling
- Faces distributions
- Property modeling
- Building a final 3D model and evaluating it
Introduction to Low Frequency Modeling using EarthModel FT

Course number: EM-110

Course overview
This course teaches Jason Workbench users how to build solid models and solid model properties that can be used for low frequency modeling in Jason Workbench. Upon completion of the course, you will be able to create finely tuned solid models that accurately represent the geologic structure of the reservoir of interest, including clean and orderly truncations of faults and horizons. EarthModel FT is capable of handling complex structure and the constructed solid models have greater accuracy in representing truncations of faults and horizons than Jason Workbench. The course material provides extensive hands-on exercises. Specific topics covered are:

- EarthModel FT breadth and basic components
- Loading and viewing input data - data organization
- Introduction to building complex structural models, make corner point grids
- Velocity data preparation, conditioning and interpolating velocities
- Transforming interval velocities to a low frequency P-Impedance model
- Merging low frequency P-Impedance model with the broadband P-Impedance model

Course benefits
- Understand how to load and quality control the data
- Build complex structural and 3D models grids
- Using 3D grids in low frequency models

Software covered
EarthModel FT and Jason Workbench

Who should attend
New EarthModel FT users that need to construct 3D grids to do inversions in Jason Workbench

Pre-requisite
Basic knowledge about geologic modeling & inversion
Jason 101

Duration
4-days

Format
Instructor-led, workflow-based, classroom training

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Introduction to Low Frequency Modeling using EarthModel FT (EM-110)

Course Outline

Day 1  The Basics
- Creating an EarthModel FT project
- Importing from Jason Workbench
- Working with folders and groups in EarthModel FT
- Organizing data within EarthModel FT
- Working with fault, horizon, and solid model assistants
- Trimming, truncating, and interpolating surfaces
- Building models
- Exporting to Jason Workbench

Day 2  Quality Control
- Trimming, truncating, and interpolating surfaces
- Evaluating the quality of the data
- Troubleshooting the surfaces by examining surface intersections, isopachs, section views, etc.
- Applying advanced trimming and interpolation techniques to eliminate surface anomalies
- Building a solid model and solid model property

Day 3  Modeling Complex Data
- Assessing the geology of the project
- Using various evaluation techniques to check the quality of the existing surfaces
- Smoothing horizons
- Interpreting new faults on seismic data in a 3D View or section view
- Performing complex truncations (faults against faults, horizons against horizons, faults and horizons against an unconformity)
- Building a final 3D model and evaluating it

Day 4  Velocity Modeling
- Evaluating initial stacking velocities
- Interpolating stacking velocities to obtain a regular distribution of the velocities on a coarse grid
- Conditioning interpolated stacking velocities
- Interpolating the conditioned stacking velocities to seismic resolution on a fine grid
- Generating pseudo logs
- Determining an appropriate merge frequency
- Transforming interval velocities to a low frequency P-Impedance model
- Merging low frequency P-Impedance model with the broadband P-Impedance model from EarthModel FT
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