

## **COMPLETION DESIGN (MODULAR Course)**

### **Detailed Course Contents**

#### **Monday (Completion Operations & Equipment A)**

*Morning (08:30 – 12:30)*

Introductions – venue / instructor / attendees / course overview

1. Completion Architecture
  - a. Well Objectives / Design Data requirements / Industry Standards / DCR Regulations
  - b. Drilling & other well construction considerations
  - c. Open Hole v Cased Hole
  - d. Horizontal / Multilateral / Intelligent
  - e. Slimhole / Monobore / Single / Dual / Insert
  - f. Key interfaces between elements of completion architecture.
  - g. Innovative Technologies / Swelling Seals / Expandable Pipe / DTS / RFID etc.
  - h. Life Cycle Issues

*Afternoon (13:30 – 17:30)*

2. Sand Face Completion
  - a. Hole Size & Liner considerations

- b. Sand Control / Sand Production Prediction / Stand Alone Screen and gravel Pack Screen & Gravel Size Selection / Expandable Screens / Frac Pack / Inflow Control
- c. Perforating Design, Specification & Execution / Estimating Static under-balance requirement / Dynamic Under-balance
- d. Fluids & Filtration

#### **Tuesday (Completion Operations & Equipment B)**

*Morning (08:30 – 12:30)*

3. Tubing String Components
  - a. Wellhead , Tree & Tubing Hanger / Surface & Subsea
  - b. Tubing Size / Tubing Strength / Tubing Connections
  - c. Subsurface Safety Valves
  - d. Nipples, Plugs and other Flow Control Devices
  - e. Packers & Tubing Movement
  - f. Artificial Lift Equipment
  - g. Material Selection & Corrosion
  - h. HPHT considerations

Afternoon (13:30 – 17:30)

4. Completion & Intervention Operations
  - a. Outline Completion Program Steps
  - b. Intervention Equipment & considerations
  - c. Well Integrity Issues
  - d. Benchmarking performance, JIPs & networking

**Wednesday (Tubing Stress Analysis)**

Morning (08:30-12:30)

1. Strength of Materials & API Documentation
  - a. Stress & Strain / Yield Strength / Tensile Strength
  - b. API Documentation
    - i. Spec 5CT - Manufacture
    - ii. TR 5C3 (Bulletins 5C2 & 5C3) – Performance Calculations
    - iii. RP 5C5 - Connections
    - iv. RP 5C7 – Coiled Tubing
2. Tubing Movement Hand Calculations
  - a. Piston

- b. Buoyancy
- c. Ballooning
- d. Buckling
- e. Temperature

Afternoon (13:30 – 17:30)

3. Design Safety Factors & Service Life Load Cases
  - a. API Uniaxial/Biaxial Stress Calculations
  - b. Von Mises equivalent Triaxial Stress Calculations
  - c. API Spec 11D1 Packer Performance Envelope
  - d. Design Factors vs. Design Safety Factors
  - e. Typical Service Life Load Cases
  - f. Deriving Internal, External & Temperature Profiles for Load Cases
4. WellCat & Osprey Tubular Designer Software
  - a. Program introduction
  - b. Basic Program Workflow
  - c. Quick Start Guide
  - d. Basic Case Study Example
  - e. Pipe weight, grade & connection selection

## **Thursday (Well Production System Modelling A)**

### Morning (08:30-12:30)

1. Introduction to Production System Modelling
  - a. Completion Design
  - b. Production Optimisation
  - c. Modelling Method
  - d. Overview of PROSPER and resources supplied with the software
2. PVT Properties of Fluids
  - a. Hydrocarbon Fluid Types & Phase Diagrams
  - b. Black Oil vs. Compositional
  - c. Black Oil Correlation Selection & Tuning / Importance of Viscosity
  - d. Working with Lab Reports / Differential vs. Flash vs. Multi-stage

### Afternoon (13:30 – 17:30)

3. Inflow Performance Relationships
  - a. Straight Line PI vs. Vogel
  - b. Darcy vs. Forchheimer (rate dependent skin) and others

- c. Oil & Gas Model selection
- d. Horizontal Well Modelling /pressure loss along wellbore
- e. Multilateral Well modelling
4. Well Skin & Damage Modelling & Design Optimisation
  - a. Skin Definition, Types & Origin
  - b. Perforation modelling & design / spf & in-situ penetration
  - c. Gravel Pack modelling & design
  - d. Stimulation modelling & design

## **Friday (Well Production System Modelling B)**

### Morning (08:30-12:30)

5. Vertical Lift Performance
  - a. Multi-phase Flow
  - b. MPF Correlation Selection & tuning
  - c. Surface Roughness & Erosional Velocity
  - d. Turner Velocity and Sand Particle Transport
6. Tubing Size Selection
  - a. Life of Well Sensitivities

- b. Tubing Equipment
- c. Stable Rates
- d. Velocity Strings & Insert Gas Lift Strings

Afternoon (13:30 – 17:30)

7. Detailed Nodal Analysis Options & Solutions Review

- a. Matching Real Field Data for Performance Prediction and Network Optimisation
- b. Enthalpy Balance Temperature Prediction
- c. Gas Lift Injection Line and Subsea Flowline Modelling
- d. Plotting & Reporting
- e. OpenServer Automation

8. Artificial Lift

- a. Gas Lift Rate & Depth of Injection Optimisation
- b. Gas Lift Design & Troubleshooting Options (Basic Introduction)
- c. ESP Design (Basic Introduction)
- d. Jet Pump & Other Lift Methods

9. Award of Certificates / Opportunity for Feedback

END OF COURSE