



# AL038:

## Advanced Analytical Chemistry for Lab Technicians in Oil & Gas Industry





## Training Description:

The good and advanced analytical laboratory can motivate dispirited teams of chemists and technicians to accomplish high quality work. It is very important for lab staff to learn how to create the success in their lab. The course is designed to provide an introduction and practical application of analytical chemistry in the laboratory. It is designed also to understand concepts of basic analytical chemistry in the laboratory, and how to apply quality standards, how to do health and safety risks assessments, how to develop the technical and methods in the lab and how to evaluate the lab results.

Further, this course is designed to provide participants an advanced, cohesive understanding of analytical chemistry methods and instrumentation to promote success in their careers. Core concepts will be presented by both participants and course instructor via lecture presentations, discussions and practical exercises. The course will be wide in scope incorporating aspects of statistics, error, limits of detection, chemical measurements, modern analytical instrumentation, and determination of chemical structure via analytical techniques. Special emphasis will be put on the appropriate preparation, and meaningful presentation, of scientific results. The participants are expected to dedicate significant effort both in and out of lectures to be successful.

## Training Objectives:

**By the end of the training, participants will be able to:**

- ✓ Understand principles of analytical chemistry in advance
- ✓ Provide an advanced understanding of the roles of quality standards, how to develop the technical, and methods in the analytical chemistry lab and how to evaluate the lab results
- ✓ Gain in-depth knowledge of analytical chemistry to devise experiments that can quantify a range of diverse chemical components
- ✓ Have proper interpretation of data (including statistics and theoretical comparisons)
- ✓ Understand the characteristics and working mechanism of common analytical tools
- ✓ Discuss the application of analytical methods to current scientific challenges
- ✓ Prepare and present data in an accurate and meaningful way

## Training Designed for:

This course is intended for all Laboratory Staff, Chemist and Lab Technicians which involved in oil & gas industry.

## Training Program:

### DAY ONE:

- ❖ PRE-TEST

### MODULE (01): BASIC CHEMISTRY

- ❖ Introduction
- ❖ Chemistry Historical and review
- ❖ Basic Principle and theory
- ❖ Atom
  - Atomic structure
  - The proton, electron and neutron





- Atomic weight (mass)
- Light, photon Energies, and Atomic Spectra
- ❖ Elements
  - Periodic table of Elements
  - Structure of Elements
  - Chemistry of Elements
  - Metals, non-metals and semi-metals
  - Isotopes
- ❖ Ions
  - Types of Ions
  - Valiancy of Ions
  - Radicals
  - Solubility of ionic Substances
- ❖ The Periodic Table
- ❖ Chemical Bonding
  - Ionic Bond
  - Covalent Bond
  - Hydrogen Bond
  - Metallic Bond
- ❖ Molecules and Compounds
  - Molecular weight of Compounds
  - Equivalent weight of Compounds
  - Mole and the Avogadro constant
- ❖ Solution
  - Solution, Mixture, Compound and Solvent
  - Standard Solution
  - Solvent Types and properties
  - PH Solution
- ❖ Acid Solution
- ❖ Base (Alkaline) Solution
- ❖ Neutral Solution
- ❖ Indicators for PH
- ❖ Stability of Acid and Base Solution
- ❖ Buffer Solution
  - Acid- Base chemistry
  - Salt Solution
  - Chemical Reactions in Solution
  - Physical behavior of Solutions
- ❖ Matter
  - Matter and Measurements
  - Electronic Structure of Matter
  - States of Matter (Gas, Liquid, Solid, Plasma)





- Physical Properties of Matter
- ❖ Units for expressing Concentration
  - Percent weight and percent volume
  - Molarity
  - Molality
  - Normality

#### **DAY TWO:**

#### **MODULE (02): WATER CHEMISTRY ANALYSIS**

- ❖ Basic Principle and Theory of Analytical Chemistry
- ❖ Analytical Chemistry and Chemical Analysis
- ❖ Type of Chemical Analysis Methods
  - Classical Methods
- ❖ Semi micro Qualitative Analysis
- ❖ Gravimetric Analysis
- ❖ Titrimetric (volumetric) Analysis
  - Instrumental Analysis
- ❖ Spectroscopy Analysis
- ❖ Chromatography Analysis
- ❖ Electromechanical Analysis
- ❖ Choosing the Right Instrument
- ❖ Source of Water
- ❖ Type of Water
  - Soft water
  - Hard water
- ❖ Type of Hardness in water
  - Pathogenic microorganisms

#### **MODULE (03): STANDARD SOLUTION**

- ❖ Standard Solution
- ❖ Type of Standard solution
  - Primary Standard Solution
  - Secondary Standard Solution
- ❖ Preparation, Handling, and Storage of standard solution
  - Molar Solution
  - Normal Solution
  - Part per million (PPM)
  - Part per billion (PPB)
- ❖ Calibration and Standardization
  - Instruments Calibration and Traceability
  - Calibration work instructions
  - Calibration Procedures, Certificate and Documentation
  - Reference Standard materials
  - Correction of errors and improving blank





- Measurement Uncertainty in testing and Calibration

**DAY THREE:**

**MODULE (04): ANALYTICAL CHEMISTRY**

- ❖ Analysis of Water
- ❖ Global Standard test methods of water and wastewater analysis
  - PH acidity and alkalinity
  - Temperature
  - Density
  - Turbidity
  - Total Hardness
  - P, M & OH Alkalinity
  - Specific conductance
  - Total Solids (TS)
  - Total Dissolved Solids (TDS)
  - Total Suspended Solids (TSS)
  - Dissolved Oxygen (DO)
  - Oxygen Demands (COD, BOD)
  - Organic Contaminants
  - Toxic Organic Compounds
  - Radioactive contaminants
  - Nutrients
  - Chloride
  - Cyanide
  - Pathogenic microorganisms
- ❖ Sulphite
- ❖ Phosphate
- ❖ Oil and Grease
- ❖ Inorganic Chemicals

**MODULE (05): TROUBLESHOOTING OF LABORATORY EQUIPMENT**

- ❖ Laboratory Equipment
- ❖ Problem, Troubleshoot and Routine Maintenance
- ❖ Comparing Instrumental Techniques
- ❖ Choosing the Right Instrument

**DAY FOUR:**

**MODULE (06): CRUDE OIL DEHYDRATION AND DESALTING PROCESS**

- ❖ Petroleum Origin
- ❖ Petroleum Composition and its Properties
- ❖ Classification of crude oil types
- ❖ Crude Oil receiving analysis
- ❖ Physical Properties of Crude Oil
- ❖ Chemical Composition of crude oil
- ❖ Evaluation of Crude Oil





- ❖ Crude Oil Treatments
  - Dehydration of Crude Oil
  - Desalting of Crude Oil
- ❖ Petroleum refining processing
- ❖ Major refinery Products
- ❖ Analysis of Crude Oil

#### **MODULE (07): GAS PROCESSING**

- ❖ Historical Review
- ❖ Natural Gas Origin
- ❖ Natural Gas sources
- ❖ Natural Gas Production
- ❖ Natural Gas Processing
- ❖ Gas- Handling Facilities and Treatment
- ❖ Stored and Delivered of Natural Gas
- ❖ Measurement of Natural Gas
- ❖ Natural Gas uses
- ❖ Properties of Natural Gas
- ❖ Physical and Chemical Properties of;
  - Natural Gas
  - Composition of Natural Gas
  - Testing and Analysis of Natural Gas
  - Composition of Natural Gas by Gas Chromatography

#### **DAY FIVE:**

#### **MODULE (08): HYDROCARBONS LABORATORY AND FIELD TESTS**

- ❖ Hydrocarbons Laboratory
- ❖ Sampling of Petroleum and Petroleum Products
- ❖ Crude oil and Hydrocarbon Products analysis (ASTM-IP)
  - Carbon Residue, Asphaltene Content
  - Density (Specific Gravity)
  - Distillation
  - Light Hydrocarbons
  - Metallic Constituents
  - Salt Content
  - Sulfur Content
  - Viscosity and Pour Point
  - Water Sediment
  - Wax Content
  - Other Tests
  - The Evaluation of Results and Methods
  - Data Analysis
  - Laboratory Report
  - Quality Control and Quality Assurance



- ❖ Course Conclusion
- ❖ POST-TEST and EVALUATION

## Training Requirements:

“Hands-on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

## Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 30% Workshops & Work Presentations, Techniques
- 20% Based on Case Studies & Practical Exercises
- 20% Videos, Software & General Discussions
- Pre and Post Test

## Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

## Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01<sup>st</sup> of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

## Training Timings:

### Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

### For training registrations or in-house enquiries, please contact:

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Training & Career Development Department

