

# PRACTICAL PROBLEM SOLVING IN CHEMICAL ANALYSIS



**CLE105**  
**Chemical**  
**Laboratory**  
**Engineering,**  
**Technology &**  
**Management**

**COURSE TITLE****PRACTICAL PROBLEM SOLVING IN CHEMICAL ANALYSIS****COURSE DATE/VENUE**

29 August-02 Sept 2022

Bangkok, Thailand

**COURSE REFERENCE**

CLE105

**COURSE DURATION**

05 Days

**DISCIPLINE**

Chemical Laboratory Engineering, Technology & Management

**COURSE INTRODUCTION**

The efficient use of chemical analysis and instrument technique are very imperative tools to solve any laboratory problem. The course provides laboratory analysis methods and troubleshooting techniques of most used instruments in any laboratory. In addition, it provides elegant tools for obtaining qualitative and quantitative data techniques with practice work on analysis Software. The aim of this course is to enrich and update the knowledge and skills of the participants for understanding the problem of chemical analysis and implementing analysis troubleshooting.

**COURSE OBJECTIVE****The Course will enable Participants to:**

- Impart the technique of solving problem in the laboratory.
- Understand and apply practically the instruments troubleshooting.

- Know the difficult task of judging the accuracy and precision of experimental data and how these judgments can be sharpened by the application of statistical methods.
- Understand the tools and techniques for achieving process analysis, qualitative methods, cause and effect diagrams and calibration graph.
- Explain the on-bottom stability by describing the design of weight coatings and identifying the impact of climate change on pipeline stability and the additional provisions on bottom stability
- Determine the various subsea pipeline failures and the different methods of repair of damaged subsea pipelines and explain the concept of cathodic protection including the design codes, methods of CP surveying, analysis of data & coating condition
- Describe internal corrosion comprising its morphology, inspection, monitoring and evaluation, identify the various types of pigging and explain their features, functions and limitations
- Implement the statistical methods used in corrosion data evaluation and the various procedures used in the prevention of corrosion
- Carryout methods of cathodic protection retrofitting and demonstrate the calculation method to evaluate protection limits

### **COURSE AUDIENCE**

The course is planned for chemist, lab technicians, chemical engineers, instrumental engineers and lab supervisors/managers.

### **COURSE CONTENT**

#### **Following Topics will be covered in details.**

1. Chemistry Fundamental
2. Introduction to Chemical Analysis Technique
3. Basic Laboratory Technique: Sample Preparation, Analytical Measurement, Fundamental Concepts, Chemical Equation, Acidity of Solution, Buffers, Gravimetric Methods of Analysis

4. Preparation of Chemicals and Problem Solving
5. Titration Methods and Methods Problem
6. Potential Selectivity of Electrolytic Methods
7. Sample Contamination
8. Analyte Extraction by Manipulation Methods
9. Introduction to Analysis Instruments
10. Gas Chromatography Technique: Inject System, Column, Detector types
11. High Performance Liquid Chromatography: Mobile Phase, Pumping System, Sample Inject system, Column, Detector Types
12. Spectroscopy Technique: Infrared Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Mass Spectrometry, Atomic Spectroscopy
13. Organic Molecules Identifying and Spectrum Problem
14. Instrument Problems and Troubleshooting: Band Broadening, Broaden in Initial Peak Bandwidths, Retention Gap Sampling, Sampling By Solute Focusing, Retention Gaps Tube, Baseline Deviation, Noisy Baseline, Spikes in Baseline, Peak Shape Problems, Flat Top Peaks, Split Peaks, Negative Peaks, Retention Changes, Ghost Peak, Causes and Prevention of Column Damage, Column Contamination, Needle Discrimination, Change in Detectors Sensitivity, Difficulty in Lighting FID Flame, Loss of Detectors Linear Range, Leaks in MS, Excessive Noise or High Background in MS Chromatography Variables Effect, Band Broadening Effect, Techniques For Minimize Peak Broadening, Efficiency of Packed Columns with Gaseous Mobile Phases, Efficiency of Packed Columns with Liquid Mobile Phases, Efficiency of Open Tubular Columns with Gaseous Mobile Phases, /Column Selection, Column Condition and Regeneration Technique, GC Sample Introduction, Split Inlet System in GC, Splitless Inlet in GC, Cool On-Column Inlets, Effect of Mobile-Phase Flow Rate, Effect of Solvent Strength on Capacity Factors, Effect of Mobile Phase on Selectivity, Selectivity in Detector.
15. Maintenance and Installation Methods: Clean and Condition Septa, Cleaning Injector Liners, Silylating Liners, Column Conditioning, Installation Fused Silica Capillary Columns, Column Placement in the oven, Column Installation, Leak

Detection, Bleed Test, Fid Jet Cleaning Procedure, TCD Clean Detector Cell, Cleaning of ECD, FPD Maintenance, Cleaning MS and Change the Filament

16. Error in Quantitative Analysis

17. Calibration Methods

18. External and Internal Standards

19. Outliers Test

20. Determination of Analyte Concentration

21. Standard Addition Method

22. Confidence Limits

23. Detection limit

24. Repeatability and Reproducibility.

25. Quality Control and Validation Method: Specificity, Linearity, Selectivity, Accuracy, Precision, Bias, Linearity, Range, Limit of Detection, Limit of Quantification, Robustness, Ruggedness, Stability

### **COURSE CERTIFICATE**

**TRAINIT ACADEMY** will award an internationally recognized certificate(s) for each delegate on completion of training.

### **COURSE FEES**

\$4,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### **COURSE METHODOLOGY**

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice

type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions

