Sub-Module	:	**Signal Performance Monitoring for analytical & Process Lab Equipment**
Prerequisite	:	**Basic Electrical & Electronics**
Duration	:	**3 Days**
PSMB Scheme	:	**SBL**
Training Approach	:	**Theory & Practical**

At the end of the module, participants should be able to:

Summary of objectives :

1. Perform and describe the important of calibration.
2. Select and use suitable test equipment (master standard unit) for calibration.
3. Identify important parameters for instrumentations. (UUT- Unit under test)
4. Describe important factors in calibration performance.

References:

1. **Intro. To Automatic Process Control.ISA,** R.Mollemkemp
2. **Fundamental of Process Control Theory,** Paul Munill (Instrument Society America)
3. **Control System,** Norman Nise
4. **Process Control Instrument Engineer's Handbook**, Bela G. Liptak
5. **Feedback and Control System**, Joseph Allen
6. **Instrumentation for Process Measurement**, Norman A. Anderson
7. **Process Control Instrumentation Technology,** Curtis D. Johnson

Course Outline:

1. Introduction to Instrument Calibration

1.1 Definition of calibration
1.2 The importance of instrument calibration
1.3 Calibration as part of maintenance
1.4 Conversion of measurement units

2. Calibration terminologies

2.1 Uncertainty, accuracy, repeatability, precision
2.2 Definition of Unit Under Test (UUT) and Master Standard Unit (MSU)
2.3 Unit traceability in calibration

3. Calibration technique.

3.1 ISO 17025 calibration guidelines
3.2 Identify calibration requirement
3.3 Calibration draft based on 5-point check.
3.4 Calibration loop schematic and preparation.
3.5 Calibration lab ambient temperature and relative humidity level.
3.6 Local screws and Brain terminals
3.7 Connection between UUT and MSU
3.8 Testing, measurement and error calculations.
3.9 Reporting Uncertainty of calibrated instrument.

4. Instrument Calibration

4.1 Identifying the temperature conversion table for RTD and various types of thermocouple
4.2 Temperature transmitter calibration
4.3 Temperature switch calibration
4.4 Temperature indicator calibration.
4.5 Identifying types of level and flow instrument
4.6 Level transmitter calibration
4.7 Flow transmitter calibration
4.8 Identifying types of pressure instrument

4.9 Pressure gauge calibration
4.10 Pressure transmitter calibration
4.11 Pressure switch calibration
4.12 Identify parts of control valve
4.13 Calibrate control valve
4.14 Identify pH instrument
4.15 Calibrate pH instrument.
4.16 Report the calibration result

5 Equipment / Machine/ Software

Machines/ Equipment Brand Name	:	Yokogawa transmitter, AVO meter, universal controller, decade resistance box, compact calibrator, Rosemount HART communicator, Transmille Multiproduct calibrator, E+H Transmitter, Ametek pressure calibrator, handpump, dead weight tester. Control valve, manometer .
Software	:	-

8. Certification

Certificate of attendance will be issued to those who fulfil 80% of attendance.