

NATIONAL METAL & ENGINEERING CURRICULUM

1. Module details

Module name	Concepts of Instrumentation
Nominal duration	Half module It is anticipated that a student possessing the skills and knowledge developed in the prerequisites will achieve the module purpose in 18 to 20 hours.
Module code	NI201
Discipline code	0703325

2. Module purpose

This module aims to provide students with knowledge and skills to interpret the Standards associated with industrial instrumentation and Calibration Principles.

3. Prerequisites

Nil

4. Relationship to competency standards

This module provides some of the knowledge and skills underpinning competence in the following standards.
Federal Metals Industry Award Standards, Unit 18.62A.

Electrical Contracting Industry Award Standards
Instrument Stream Units 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8

5. Content

Summary of content

1. Flow, temperature, pressure and other appropriate measurements.
2. Appropriate terminology:
span, range, accuracy, precision, errors, zero, repeatability, sensitivity, hysteresis, etc (select from AS1541).
3. Development of SI Units, engineering and scientific notation, imperial and metric conversion using calculations, mm Hg, mm Hg, Pa (hPa, kPa, MPa etc), inches water, PSI, etc. Also non-standard SI Units - kg/cm², etc.

4. Instrumentation Standards - brief overview only
 ISA - Instrument Society of America
 ISO - International Standards Organisation
 SAMA - Scientific Apparatus Manufacturers
 America
 BSI - British Standards Institution
 AS - Australia Standards
 ANSI - American National Standards Symbols and
 Terminology
 Manufacturer Calibration Standards
 Fluids in Process Piping Colour Coding.
5. Identification and purpose of instruments measuring
 processes directly and those measuring indirectly.
6. Signal transmissions of two-wire, 20-100 kPa, 4-20
 mA, 1-5 V, other applicable standards.
7. Principles of Levers and Links and calibration of
 indicator recorder instrument.
8. Application of safety standards at all times - tools,
 lifting techniques, electrical safety and CPR,
 pressure lines, housekeeping.
9. Interpretation of appropriate graphs and tables
 associated with instrumentation.

6. Assessment strategy

Assessment method

Short-answer tests
 Practical exercises/tests
 Practical skills/laboratory reports

Conditions of assessment

Normally learning and assessment will take place in a
 classroom/laboratory environment.

7. Learning outcome details	On completion of this module the learner will be able to:
Learning outcome 1	Outline the purpose of instrumentation.
Assessment criteria	1.1 Identify the role of measurement in industrial processes.
Learning outcome 2	Define terminology used in instrument measurement.
Assessment criteria	2.1 Define terminology.
Learning outcome 3	Convert Imperial and SI metric measurement units mathematically, and express in terms of engineering or scientific notation.
Assessment criteria	3.1 Conversion of units correctly.
Learning outcome 4	Identify the standards applicable to Instrumentation and Process control.
Assessment criteria	4.1 Differentiate between the different levels of Instrumentation Standards and Comparison Equipments. 4.2 Identify fluids and respective colour coding used in process piping 4.3 Identify common instrument symbols.
Learning outcome 5	Measure standard transmission signals applicable to Instrumentation and Process control.
Assessment criteria	5.1 Identify and measure standard transmission signals.
Learning outcome 6	Demonstrate an understanding of simple calibration process applicable to Lever/Link mechanisms.
Assessment criteria	6.1 Check the calibration of an indicating or recording instrument.

Learning outcome 7 Demonstrate safety working practices at all times.

Assessment criteria 7.1 Application of safe procedures in the Instrument laboratory in the use of correct hand tools, air supplies, lifting methods, electrical safety and housekeeping.

Learning outcome 8 Interpret tables and graphs.

Assessment criteria 8.1 Develop a graph from a table and interpret calibration figures/error.

8. Delivery of the module

Delivery strategy Delivery strategies must be suitable for both theoretical and/or practical learning and module purpose.

It is recommended that learning and assessment be facilitated in a holistic manner which may require a learning outcome sequence other than that indicated in the body of this module.

Also an integrated theory/practice approach should be used where students learn by experimentation and through research and laboratory reports.

Resource requirements To complete this module students will need access to sufficient measurement, test and signal generation equipment to allow each student to undertake individually the practical and assessment tasks.

Useful references include:

Bolton, W. 1991, *Instrumentation and Process Measurements*, Longman Group UK Limited.

Jones, E.B. 1985, *Jones' Instrument Technology*, Vols. 1 and 2, 4th edition, Butterworths, Borough Green, England.

Considine, D.M. 1985, *Process Instruments and Controls Handbook*, 4th edition, McGraw-Hill, New York.

Anderson, N.A. 1980, *Instrumentation for Process Measurement and Control*, 3rd edition, Chilton Company, Adnor, Pennsylvania.

Johnston, C. 1993, *Process Control Instrumentation*, 4th edition, Regents/Prentice Hall, Englewood Cliffs, New Jersey.

Occupational health and safety requirements A safe and healthy environment will be provided for students in regards to classroom and laboratory safety.