

Module Title:	Process Instrumentation
Language of Instruction:	English
Credits:	5
NFQ Level:	7
Module Delivered In	4 programme(s)
Teaching & Learning Strategies:	Lectures will incorporate a mixture of presentations, examples and student exercises/problem-solving, question and answer sessions, group discussions and online resources. Students will also work collaboratively from time to time in the completion of exercises and development of solutions.
Module Aim:	The aim of this module is to enable students to develop an understanding of the principles of operation for a range of industrial measurement instruments (for Pressure, Level and Temperature measurement) and to use this knowledge to usefully consider selection, installation and application issues relating to the measurement systems.

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Interpret and apply the terminology and methods used to describe the specification and performance of industrial measurements instruments.
LO2	Explain the principles of operation of the most common instruments used to measure Pressure, Level, Flow and Temperature in industrial applications.
LO3	Implement the equipment and procedural requirements for bench and field calibration of a range of the instruments covered.
LO4	Discuss the relevant process and application parameters to be considered for correct instrument selection and installation.

Pre-requisite learning	
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

Module Content & Assessment

Indicative Content

Measurement Terminology

Definition and explanation of terms used for instrument specification and to quantify the quality and reliability of measurements taken. Significance of process variable measurement to the overall production process and the ethics involved in measurement and control.

Pressure Measurement

Pressure Basics; Nature of pressure, types of measurement (absolute, gauge and differential). Measurement Principles; elastic deformation and liquid column. Practical Implementation; manometers, diaphragm, Bourdon tube etc. Pressure Switches and Transmitters (Smart & Dumb). The mA analogue current transmission loop. Installation and application. Precautions and ancillary equipment.

Level Measurement

Level Basics; definitions, nature of level, vessel designs, volume, contents (liquids/solids). Measurement Principles; hydrostatic, capacitance, ultrasonic and radar techniques. Practical Implementation. Level Switches. Installation and application.

Flow Measurement

Flow Basics; definition, type of flow measurement. Measurement principles; differential pressure, velocity, temperature, density. Practical Implementation. Installation and application.

Temperature & Heat Measurement

Temperature Temperature scales. Process issues specific to temperature measurement. Measurement Principles; expansion, bimetallic, resistance change, thermo-voltaic, Practical Implementation; RTDs, thermocouples etc. Thermostats. Installation and application.

Calibration

Calibration Principles including ethical consideration in instrument data collection, terminology, procedures, precautions, standards, limitations, documentation and scheduling. Solve linear equations to calculate instrument output in units and percentage of range along with percentage error for given process conditions. Individually and as part of a group carry out practical bench calibration on typical industrial pressure, level and temperature measurement instruments and collaboratively develop calibration procedures for wet (field) calibrations.

Assessment Breakdown	%
Continuous Assessment	75.00%
Practical	25.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Class Test	1	15.00	Week 5
Examination	Class Test	1,2,3	30.00	n/a
Written Report	Written Assignment - Instrumentation selection and system design	1,2,3,4	30.00	Sem 1 End

No Project

Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Labs: Pressure, temperature, level and flow measurement.	1,2,3	25.00	Every Second Week

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	3.00
Lab/Lecture	12 Weeks per Stage	2.00
Independent Learning	15 Weeks per Stage	4.33
Total Hours		125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EFARG_B	Bachelor of Engineering (Honours) in Agricultural Systems Engineering	6	Elective
CW_EMMEC_B	Bachelor of Engineering (Honours) in Mechanical Engineering	6	Elective
CW_EFARG_D	Bachelor of Engineering in Agricultural Systems Engineering	6	Mandatory
CW_EEMEC_D	Bachelor of Engineering in Mechanical Engineering	6	Elective