



**I. COURSE DESCRIPTION:**

Upon completion the apprentice is able to: identify and describe the operation of pressure, level and flow devices, draw basic process and instrument diagrams using standard ISA symbols; explain the operation and application of typical level and flow measurement devices and transmitters; demonstrate the hydrostatic pressure principle of liquid level measurement; predict with calculations the effect of liquids of different specific gravities on the system; demonstrate the use of the venturi and the orifice plate in flow measurement

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

1. ***Describe the concept of direct and indirect measurement***
2. ***Describe the concept and operation of level sensing elements including float. Switches, point contact, sight glass, capacitance devices, ultrasonic, radiation and bubblers***
3. ***Draw basic process diagrams according to ISA standards***
4. ***Determine the outputs of various level measuring devices***
5. ***Explain the concept of weight, mass density and specific gravity.***
  - Describe the concept of hydrostatic and determine the pressure exerted by a column of fluid
  - Connect and test a system to measure the hydrostatic pressure
  - Describe the concept of fluid flow
  - Identify and describe the operation of various flow sensing elements including rotameter, venturi, and orifice plate.
  - Draw basic P&I diagrams for flow measurement using standard ISA instrumentation symbols
  - Determine the output of various flow meters
  - Demonstrate flow devices by connecting and testing differential pressure transmitters
  - Explain the operation of voltage and current instrumentation loops.
  - Install, connect, zero, and span an instrumentation control loop.
  - Explain the purpose of shielded cable in instrumentation and demonstrate the proper shield grounding techniques.
  - Explain the operation of intrinsic safety barriers.
  - Describe the operation of load cells and their applications.

**III. TOPICS:**

1. Pressure
2. Hydrostatic Pressure
3. Gas pressure
4. Level
5. Flow elements
6. ISA Standard Symbols

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

*Labvolt Instrumentation Training Manual* by Sault College

**V. EVALUATION PROCESS/GRADING SYSTEM:**

<b>Theory = 2 tests</b>	<b>50%</b>
<b>Labs Work and Reports</b>	<b>20%</b>
<b>Practical Test(s)</b>	<b>20%</b>
<b>Assignments and work ethics</b>	<b>10%</b>
<b>Total</b>	<b>100%</b>

**Note : The student must pass both the theory portion and the lab practical test portion of the course to pass**

The following semester grades will be assigned to students:

<b>Grade</b>	<b><u>Definition</u></b>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

## VI. SPECIAL NOTES:

### Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

**Use of cell phones/PDAs for any form of communication (voice, text...) during class or lab time is strictly prohibited. Cell phones/PDAs must be silenced during regular class and lab times and must be turned off and kept out of sight during test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 being assigned.**

### Labs

Attendance to scheduled lab activities is compulsory, unless permission has been granted by the instructor. Lab attendance and final grade are directly related. If a student arrives late for, or is not continuously present and actively participating at (scheduled breaks excepted), a scheduled lab class he/she will be considered absent for the entire class and will not be permitted to submit the associated lab report.

**Students must continuously wear all Sault College required personal protective equipment (PPE) during lab activities. Failure to do this will result in expulsion from the lab activity and a grade of zero being assigned. Students are expected to be wearing their required PPE prior to entering the lab.. Successful completion of this orientation will be demonstrated by the student completing a quiz with a minimum grade of 100%.**

**The instructor will advise what specific PPE is required. If a student repeatedly neglects to wear PPE as required he/she will be considered to be in violation of the Sault College Academic Code of Conduct and may be sanctioned accordingly (see Student Code of Conduct & Appeal Guidelines). For instance, first violation – verbal warning, second violation written warning, third violation suspension from lab activities. Students must complete a lab safety orientation prior to participating in lab activities**

All lab reports are to be computer generated. Hand written reports will not be accepted.

All lab reports are to include a title page with the following information in the following sequence:

- Name
- Lab title and number
- Due date
- Date submitted
- Course number
- Names of group members
- Instructor's name

Lab reports are to include all procedures, observations and questions listed in the order they appear in the lab handout and numbered to match the lab handout. Maximum 2 members per group unless approved by the instructor. Each member must submit a lab report.

Lab reports are due at the beginning of class 1 week after the scheduled period in which it was done. A **penalty of 10% per day** will be assessed for late submissions. It is recommended students submit lab reports prior to the deadline to avoid late submissions due to unforeseen circumstances (i.e. bad weather, transportation problems...).

Labs that are more a week late will not be accepted.

Students are not permitted to work on live equipment outside of regular class time and may not work in the lab without faculty permission. This permission will not be considered outside of the regular 8:30am to 4:30pm, Monday – Friday time period.

Students must supply their own personal protective equipment (PPE). Students will not be permitted in the lab if not wearing required PPE. Students must never work alone in the lab. Unsafe work habits will not be tolerated.

Students are expected to maintain a clean and organized work area. Failure to put away equipment (in assigned location) and to clean up after a lab activity will result in a **penalty of 10%**.

### **Final Marks**

The student must maintain a minimum 50% average in **both the theory portion and the practical lab** portion of the class in order to receive a passing grade. If a student misses a test/lab he/she must have a valid reason (i.e. medical or family emergency – documentation may be required). In addition, the instructor **must** be notified **prior** to the test or lab sitting. If this procedure is not followed the student will receive a mark of zero on the test/lab with no make-up option. Students may not submit lab reports for labs in which they were not in continuous attendance

**Any make up test will be completed after classes end and before marks are due.**

**VII. COURSE OUTLINE ADDENDUM:**

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.