

EXPERIMENT 1: MEASUREMENT AND UNCERTAINTY**Course Learning Outcome:**

Solve problems related to Physics of motion, force and energy, waves, matter and thermodynamics
(C4, PLO 4, CTPS 3, MQF LOD 6)

Learning Outcomes:

At the end of this lesson, students will be able to describe technique of measurement and determine uncertainty of length of various objects.

Student Learning Time:

Face-to-face	Non face-to-face
1 hour	1 hour

Direction: Read over the lab manual and then answer the following question.

Introduction

1. Complete **Table 1**

Basic Quantity	Symbol	SI Unit (with symbol)	Measuring Instrument
Length	l		
Mass	m		
Time	t		
Electric Current	I		
Temperature	T		

Table 1

2. is used to measure the diameter of a coin.
3. Micrometer screw gauge is usually used to measure the of a thin wire or the of paper.

4. Complete **Table 2**

Measuring Instrument	Uncertainty
Ruler 	
Vernier Calipers 	
Micrometer screw gauge 	

Table 25. State **TWO** types of reading;

- i.
- ii.

6. The repeated reading for a measurement is given as a , b , c , d , and e . Write the equation of Average Value and Uncertainty.

	EQUATION
Average Value, $\bar{x}$	
Uncertainty, $\Delta\bar{x}$	

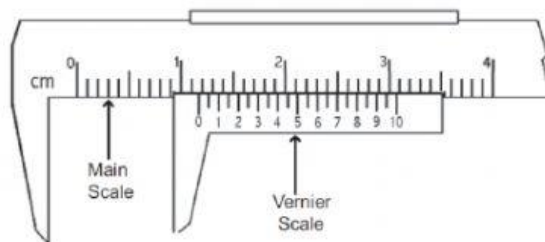
Experiment

7. Complete Table 3

Measurement	Measuring Instrument	Uncertainty/ Smallest scale	Type of reading (single point/two point/Vernier scale)
Length of a book			
Diameter of a spherical object			
Width of a square object			

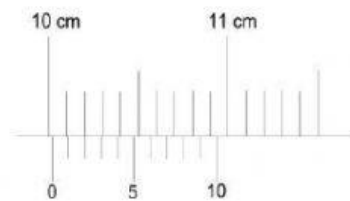
Table 3

8. Determine the reading for the following measurements:



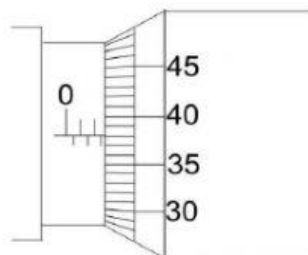
Main scale :
 Vernier scale :
 Actual reading :

Uncertainty: ± 0.05 mm



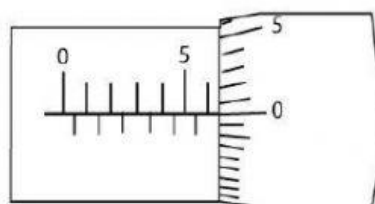
Main scale :
 Vernier scale :
 Actual reading:

Uncertainty : ± 0.01 mm



Main scale :
 Vernier scale :
 Actual reading :

Uncertainty : ± 0.01 mm



Main scale :
 Vernier scale :
 Actual reading :
 Uncertainty : ± 0.01 mm

Data Analysis

9. Complete **Table 4**

No	Diameter of ball bearing, $d (\pm 0.01 \text{ mm})$	$ d - d_i $ (mm)
1	2.50	
2	2.52	
3	2.51	
4	2.50	
	Average =	$\Delta d =$

Table 4

10. Express your answer as $(\underline{d} \pm \Delta \underline{d})$

11. Calculate the percentage of uncertainty.

12. List THREE precautions of the experiment:

- i.
- ii.
- iii.

