KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

POLITEKNIK MALAYSIA
KUCHING SARAWAK

DEPT. OF MECHANICAL ENGINEERING		
DJJ20273 FLUID MECHANICS		
LECTURER NAME		
TYPE OF ASSESSMENT		
TOPIC		
DURATION		
DATE OF ASSESSMENT		
STUDENT'S INFORMATION	NAME	REGISTRATION NO.
TOTAL MARKS	CLO3	/MARKS

Nota :

i. *Bagi kursus seperti MPU22042 Bahasa Kebangsaan A dan lain-lain kursus yang diajar dalam Bahasa Melayu maka penggunaan bahasa pada muka hadapan lembaran kerja dan arahan/kandungan pada lembaran kerja adalah menggunakan Bahasa Melayu sepenuhnya.*

POLITEKNIK MALAYSIA
KUCHING SARAWAK

DJJ20273 - FLUID MECHANICS

ASSESSMENT NO. 4 FRICTION FACTOR AND REYNOLD'S NUMBER

CLO NO. CLO3	CLO STATEMENT Organize appropriate experiments in groups according to the Standard Operating Procedures.	PLO NO. P4, PLO5	DK DP NA DK6: ENGINEERING PRACTICE DP1: DEPTH OF KNOWLEDGE DP2: RANGE OF CONFLICTING REQUIREMENT DP3: DEPTH OF ANALYSIS REQUIRED

A. OBJECTIVES

To study the relationship between friction factor and Reynold's number.

B. LEARNING OUTCOME

At the end of the lab session students should be able:

i. **Understanding Fluid Dynamics**: Students will demonstrate an understanding of the principles of fluid dynamics, including the concepts of laminar and turbulent flow, and how these regimes are characterized by the Reynolds number.

ii. **Application of Theoretical Concepts**: Students will be able to apply theoretical knowledge to real-world scenarios, explaining how the relationship between the friction factor and Reynolds number impacts engineering designs and fluid transport systems.

C. TOPIC SUMMARY/ THEORY

The relationship between the friction factor and Reynolds number is important in understanding how fluids flow through pipes.

1. **Reynolds Number**: This number helps determine whether the flow is smooth (laminar) or chaotic (turbulent). Low Reynolds numbers indicate laminar flow, while high numbers indicate turbulent flow.

2. **Friction Factor in Laminar Flow**: In smooth, laminar flow, the friction factor decreases as the Reynolds number increases. This means that smoother flows face less resistance.

3. **Friction Factor in Turbulent Flow**: In turbulent flow, the relationship is more complicated. The friction factor also decreases with increasing Reynolds number, but it is influenced by the roughness of the pipe's surface.

4. **Practical Importance**: Understanding how these two factors relate is essential for engineers when designing pipe systems. It helps predict how much energy will be needed to move fluids efficiently.

In summary, while both types of flow see a decrease in friction factor with increasing Reynolds number, the details differ significantly between smooth and rough conditions.

D. MATERIAL / TOOLS

i. Losses in Piping System (D1131)
ii. Calculator

E. GENERAL INSTRUCTION / SAFETY PROCEDURE

i. Wear suitable attire when in the lab.
ii. Wear safety goggles while handling the liquids.
iii. Always clean droplets or excessive liquid at the working area during and after experiments.
iv. Always obey the Lecturer/Lab Assistant instructions.

F. WORK INSTRUCTION / PROCEDURE

i. Perform the start-up procedure.
ii. Select the desired pipe.
iii. Connect tapping pressure in between the selected pipe to differential pressure transmitter and to the manometer.
iv. Fully open MBV-109 and MBV-110.
v. Ensure other ball valves are fully closed.
vi. Start P-101 and slowly open MGV-101 until the level starts to show up in the tube manometer.
vii. Allow the flow to be stabilized and record the reading on the digital indicator.
viii. Record the differential pressure between P1 and P2 and the height difference in tube manometer.
ix. Repeat steps 5-8 by slightly increasing the flowrate.
x. Do not overflow the level in tube manometer.
xi. Repeat steps 1-10 for different tubes.

G. RESULT

D (mm)	Q (L/min)	V (m/s)	ΔP (kPa)	Re	ΔH (m)	f
28	17.9		0.2319		0.02	

Note: Take ε pvc = 0.0015mm; μ = 8.9 x 10^{-4} kg/m.s

H. DISCUSSION

Show your calculation how to find Re and find the value of f from Figure 1.

Explain the relationship between friction factor and Reynold's number.

I. REFERENCES

Douglas,J.F, J.M Gasiorek & J.A Swaffield (1996). Fluids Mechanics – (3rd Edition). Longman:

Singapore Prasuhn, Alan L (1980). Fundamentals of Fluid Mechanics. Prentice-Hall: London

Bagu, C & Mudin, H (2020). Fluid Mechanics Laboratory Experiments and Demonstrations – (Polytechnic Edition). MSR Enterprise.

Dr. Pruthviraj U. (2024). Virtual Labs. Fluid Mechanics Lab. https://fm-nitk.vlabs.ac.in/

PREPARED BY: *(Course Lecturer)* *……* ***( )*** ***Date:***	***CHECKED BY:*** *(Course Coordinator/ Head of Programme)* *……* ***( )*** ***Date:***	***APPROVED BY:*** *(Head of Programme/ Head of Department)* *……* ***( )*** ***Date:***

APPENDIX

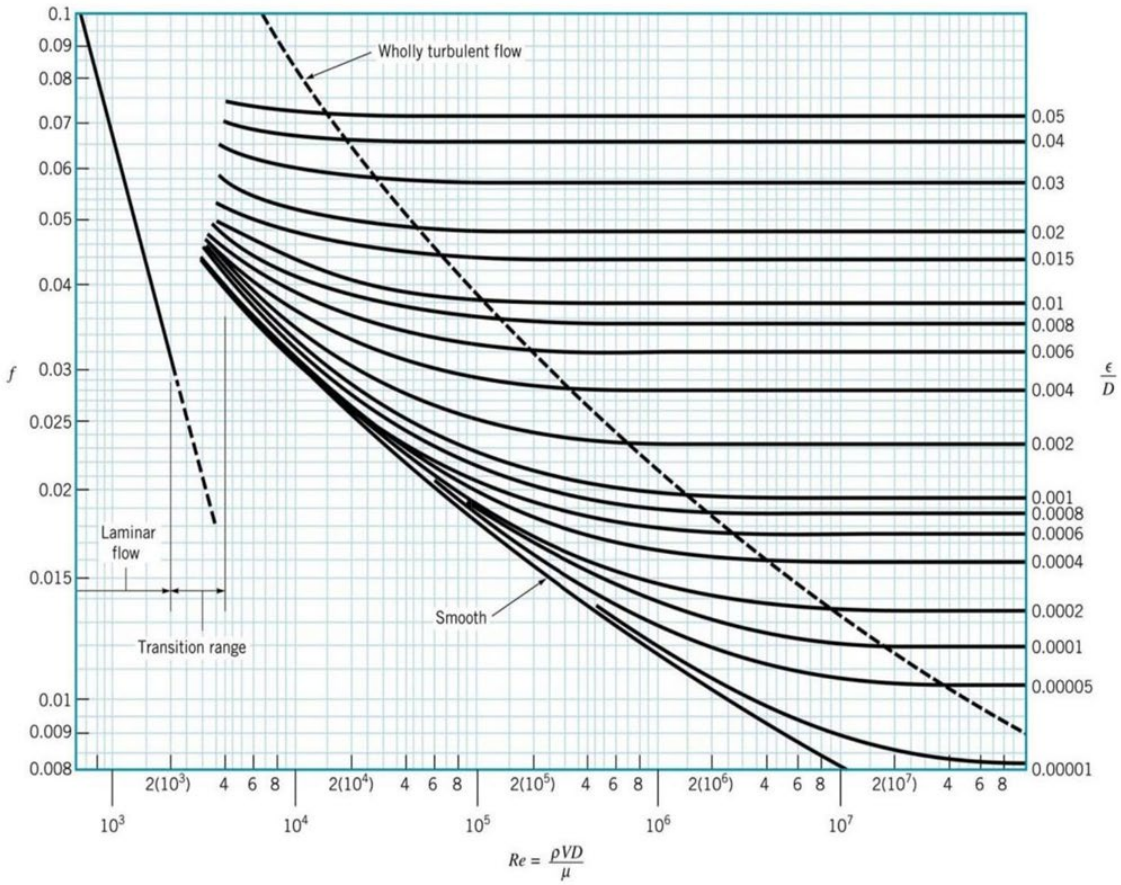

Figure 1: Relationship between friction factor and Reynold's number.