

Course Code	Course Name	Credits
26PH104	VACUUM SCIENCE	04

Course Objectives

- To know the properties of rarefied gases
- To know the basic working mechanism of vacuum pumps

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand then kinetic theory of gases.
- Understand the vacuum parameters.
- Understand the various applications of vacuum pumps.

Unit 1 - Physics of Rarefied gases (12 Hrs.)

Kinetic theory of gas, Gas law, mean free path, viscosity of gas, diffusion of gases, resistance and conductance of vacuum pipework, gas flow in pipework, Pump down time, absorption and desorption of gases, Solubility of gases, Permeation of gases through solid, vapor pressure.

Unit 2 – Production of vacuum (12 Hrs.)

Classification, type and ranges of vacuum pumps, Vacuum pump variables, baffles and traps

Unit 3 - Measurements of vacuum parameters (12 Hrs.)

Classification, types, and ranges of vacuum gauges, measurement of partial pressure, Flow measurement, leak testing.

Unit 4 – Vacuum system components (12 Hrs.)

Vacuum system engineering, vacuum joints, seals, valves, feed-through, view ports, vacuum materials.

Unit 5 - Applications of vacuum technology (12 Hrs.)

Vacuum system and components for electronics, metallurgy, chemical and nuclear field.

Reference Books:

1. Fundamental of vacuum technique by A Pipko, V. Pliskovsky, B.Korolev, V.Kuznetsov, Mir Publisher, Moscow 1984
2. Scientific foundations of vacuum Technique, by S Dushman, John Wiley & Sons Inc. New York 1962.
3. Vacuum Technology and Applications, by D.J. Hucknall, Butter-Heinemann, Oxford, 1991

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc22_ge30/preview
2. <https://youtu.be/XpKAiBAO0Sc?si=C3m24OsI83zmZdNL>
3. https://youtu.be/xT2x7okaqQM?si=3C02JbJIN8d_xrA2



COs and Bloom's Taxonomy Mapping – 26PH104

Course Outcomes	On successful completion of this course, students will be able to	BTL
CO1	Recall and list key concepts, laws, and equations related to the physics of rarefied gases and vacuum technology, including the kinetic theory of gases and gas laws.	K1
CO2	Explain the principles behind the behavior of rarefied gases, including viscosity, diffusion, and the mean free path.	K2
CO3	Apply theoretical concepts and mathematical techniques to solve problems related to vacuum measurements and gas flow in vacuum systems.	K3
CO4	Analyze the components of vacuum systems, including vacuum pumps and gauges, and evaluate their performance in various applications.	K4
CO5	Critically evaluate the effectiveness of different vacuum systems and propose innovative solutions for specific applications in electronics and metallurgy.	K5, K6

BTL (Bloom's Taxonomy Level) - K1 – Remembering, K2 – Understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6 - Create

Relationship Matrix – 26PH104

Course Outcomes	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)						Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	2	1	1	1	3	1	2	1	1	1	1.58
CO2	2	3	2	1	1	1	1	3	2	2	1	1	1.67
CO3	2	2	3	2	1	1	1	2	3	2	1	1	1.75
CO4	2	3	2	1	2	1	1	2	2	3	2	1	1.83
CO5	3	3	2	3	2	3	1	2	3	2	3	3	2.50
Total													1.87

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

