Master of Science – Nano Science & Nano Technology

(M.Sc.) (Nano Science & Nano Technology) Semester –I

Course Code	PS01CNST53	Title of the Course	Basic aspects of Vacuum Technology and Thin films
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	1. Familiarity with vacuum technology and thin films

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction, history and development of vacuum technology, units of vacuum, classification of vacuum ranges, vacuum pumps for low, medium and high range. Vacuum gauges – an introduction, pressure/vacuum gauges for low, medium,high and ultrahigh vacuum, materials for vacuum system, leak detection and repair in vacuum system.	25%
2.	Thermodynamics and kinetics foundation, equilibrium vapour pressure of materials clausius clapeyron equation, atomistic concept of gas pressure and temperature, impingement rate of molecules on a surface and free path of gas molecules.	25%
3.	Substrates an introduction, substrate materials, requirements of a substrate material, importance of substrate cleaning, substrate cleaning methods. Thin film preparation methods, evaporation phenomena of compounds, evaporation with and without dissociation, evaporation of alloys and mixtures, special evaporationtechniques**.**	25%
4.	Condensation, nucleation and stages of thin film growth, deposition rates monitoring and film thickness, sources of electrical resistively in metallic films, commonly measured quantities for thin films, film resistor/capacitor materials.	25%

Teaching-Learning Methodology	Group discussion/ Panel/Presentation

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Understand theories behind vacuum generation and measurements and thin film deposition methods
2.	Handle different vacuum generation pumps and vacuum gauges
3.	Synthesize (deposit) films of different materials and study their basic properties

Suggested References:	
Sr. No.	References
1.	Rao, V. V., Gosh, T. B., & Chopra, K. L. (1998). *Vacuum science and Technology* (Vol. 1). Allied Publishers.
2.	Glang, R., Maissel, L. I. (1970). *Handbook of Thin Film Technology*. Edited by Leon I. Maissel and Reinhard Glang. McGraw-Hill Book Company.
3.	Chopra, K. L. (1979). *Thin film phenomena*. R. E. Krieger Publishing Company.
4.	George, J. (1992). *Preparation of thin films*. CRC Press.

On-line resources to be used if available as reference material
On-line Resources

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