



**Master of Science – Materials Science**  
**(M.Sc.)(Materials Science) Semester –I**

Course Code	PS01CMTS53	Title of the Course	Thin Film Materials
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	1. Familiarity with vacuum technology and thin films
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Course Content		
Unit	Description	Weightage* (%)
1.	Introduction, Vacuum pumps, Oil sealed rotary pump, Oil diffusion pump, Adsorption and Absorption, Sorption pumps, Getter pumps used for generation of vacuum in different ranges. Vacuum leak, Leak detection, test and repair. vacuum measurements, Vacuum gauges(direct and indirect) used for low, medium and high vacuum measurements.	25%
2.	Thermodynamics and kinetics foundation, equilibrium vapor 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.	Substrate, Substrate function and its importance, Substrate materials and selection, Substrate cleaning and its importance, cleaning methods. Evaporation of compounds alloys and mixtures, special film evaporation techniques, Reactive, two/multi source and Flash evaporation techniques.	25%
4.	Condensation, nucleation and growth of continuous thin films. Film thickness, its importance and impact on properties, deposition rate control. Adhesion and its importance, methods of measurement of adhesion. Electrical properties of thin films, sources of electrical resistivity in metallic conductors, commonly measured quantities, Sheet resistance, thin film resistors and resistor materials, Film dielectrics.	25%

Teaching-Learning Methodology	Group discussion/ Panel/Presentation
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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 learner will 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). <i>Vacuum science and Technology</i> (Vol. 1). Allied Publishers.
2.	Glang, R., Maissel, L. I. (1970). <i>Handbook of Thin Film Technology</i> . Edited by Leon I. Maissel and Reinhard Glang. McGraw-Hill Book Company.
3.	Chopra, K. L. (1979). <i>Thin film phenomena</i> . R. E. Krieger Publishing Company.
4.	George, J. (1992). <i>Preparation of thin films</i> . CRC Press.

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

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