



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

Course Code	PS01CNST52	Title of the Course	Interfaces and Adhesion in Materials
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	1. To enhance knowledge of surface science 2. To provide fundamental information on materials interfacial phenomena
--------------------	--

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction to Materials & Materials Science. Type of materials, Smart materials, Properties of materials, levels of structure and surface modification-etching, grinding, processing of materials, structure-property – processing relationship. Environmental effect of Materials behavior, Materials selection.	25%
2.	Adhesion science, Definition of terms, Adhesion between two dry solids, Adsorption forces at solid surfaces, Luting agent, Cold and Hot gun adhesive, Methods of achieving surface contact, Liquid-solid interface, Laplace law, Young equation, Wetting characteristics, Electrostatic theory of adhesion, Mechanical theory of adhesion, Diffusion theory of adhesion, Weak boundary layers	25%
3.	Brief history, laws of friction and their interpretation, effect of surface topography, chemistry, mechanical and physical properties. Wear of materials including metals, ceramics, polymers and their testing. Types of wear, Influence of environmental aspects. Archard wear law, Beneficial wear. Lubrication, Lubricants, boundary and hydrodynamic theory. Effect of additive and viscosity on surface protection. Lubrication at low and high temperatures, theory of lubrications.	25%
4.	Adsorption, desorption, adsorption of gases by solids, physical adsorption experimental methods, Langmuir, BET and other theories-surface area, pore size and pore volume, Isotherms, Physisorption and Chemisorption, Adsorbate and adsorbent, Catalyst, Types of catalysts, Materials Science and catalysis, Role of different materials for catalysis, Turn over number, Nanocatalyst, Applications of catalysts	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 learner will be able to	
1.	Apply knowledge for adhesion, adsorption and tribology fields.
2.	Thorough knowledge in the subject can enhance student's ability in the field of surface science of different materials.
3.	Get the conceptual information on texture properties

Suggested References:	
Sr. No.	References
1.	Packham, D. E. (2005). <i>In Handbook of adhesion second edition</i> . John Wiley & Sons: West Sussex, England.
2.	Askeland, D.R., Fulay P. R. & Wright W. J. (2010). <i>The Science and Engineering of Materials</i> . Cengage Learning, Stamford, CT, USA.
3.	Pizzi, A., & Mittal, K. L. (Eds.). (2017). <i>Handbook of adhesive technology</i> . CRC press.
4.	Viswanathan, B. (2002) <i>Catalysis: Principles and Applications</i> . CRC Press.
5.	Callister, W. D., & Rethwisch, D. G. (2018). <i>Materials science and engineering: an introduction</i> (Vol. 9). New York: Wiley.
6.	Goodwin, J. (2009). <i>Colloids and interfaces with surfactants and polymers</i> . John Wiley & Sons.
7.	Raghavan, V. (2004) <i>Materials Science and Engineering</i> , PHI Learning.





8.	Miyoshi, K. (Ed.). (2019). <i>Solid lubrication fundamentals and applications</i> . CRC Press.
9.	Kemeny, G. (1984). <i>Surface analysis of high temperature materials: Chemistry and topography</i> . London and New York, Elsevier Applied Science Publishers, 1984, 181.

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

On-line Resources

https://www.micromeritics.com/Repository/Files/intro_to_chemical_adsorption.pdf

https://nptel.ac.in/content/storage2/courses/112108150/pdf/Lecture_Notes/MLN_01.pdf

<https://nptel.ac.in/courses/112/102/112102015/>

<https://www.nios.ac.in/media/documents/313courseE/L17.pdf>

