

PMM331: SURFACE ENGINEERING

L	T	P	Cr
3	1	0	3.5

Course Objective(s): To familiarize the students with basic principles of various surface modification techniques in engineering materials. To provide ideas on the importance of surface engineering techniques and their impacts in industrial applications. To give introduction to important surface characterization techniques.

Introduction: Importance of surfaces and wear surface properties in engineering applications, Current status of surface engineering. Wear modes; Categories of wear, Low stress, High stress and Goughing abrasion, Cavitation, Slurry erosion, Impingement erosion, Fretting wear, Adhesive wear, Seizure, Galling, Oxidative wear, Spalling, Impact wear brinelling.

Plating Processes: Fundamentals of electroplating, Electrodeposition from plating baths, Electroless plating, Metallizing, Selective plating, Hard anodizing, Other plating processes, Applicability of plating for wear resistance.

Thin Film Coatings: Thermal evaporation, PVD and CVD, Sputter coating, Ion plating, Thin film for wear application, Coating specifications.

Special Surfacing Processes: Rebuilding and surface cements, Wear tiles, Electrospark deposition coatings, Fused carbide cloth ceramic coatings, Wear sleeves, Wear plates.

Hard facing processes and applications: Shielded metal arc welding, Gas tungsten arc welding, Gas metal arc welding, Flux coaxed arc welding, Submerged arc welding, Plasma arc welding oxyacetylene welding, Furnace fusing, Thermal spray processes and their applications, Hardfacing transformation, Fusion alloys, Non fusion materials. Hardfacing in new designs, Hardfacing for repairs, Hardfacing with fusion processes, Nonfusion deposits, Weldability considerations, Finishing considerations.

Course Learning Outcomes (CLO):

Students will learn fundamentals of some of the very important techniques used in metallurgical industries to enhance materials' mechanical as well as corrosion and erosion properties.

Recommended Books:

1. *Budinski, K.G., Surface Engineering for Wear Resistance, Prentice Hall (1988).*
2. *Mathews, A., Advanced Surface Coatings: A Hand book of Surface Engineering, Spinger (1991).*
3. *Hocking, M.G., Metallic and Ceramic Coatings, John Wiley (1989).*
4. *Strafford, K.N., Datta, P.K., and Gray, J.S., Surface Engineering Practice, Processes, Fundamentals and Applications in Corrosion and Wear, Ellis Harwood (1990).*