

1. SURFACE ENGINEERING

Module I (8 Hours)

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 Gouging abrasion, Cavitation, slurry erosion, Impingement erosion, Fretting wear, Adhesive wear, Seizure, Galling. Oxidative wear, Spalling, Impact wear Brinelling

Module II (14 Hours)

Plating Processes: Fundamentals of electroplating, electrode position from plating baths, electroless plating, metalizing, selective plating, hard anodizing, other plating processes, applicability of plating for wear resistance.

Diffusion processes: Carburizing, pack carburizing, gas carburizing, liquid carburizing, vacuum carburizing, nitriding, gas nitriding, salt nitriding, iron nitriding, carbonitriding.

Surface Hardening: Flame hardening, induction hardening, electron beam hardening, laser hardening, iron implantation. 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.

Module III (12 Hours)

Hard facing Processes and applications: Shielded metal arc welding, gas tungsten arc welding, gas metal arc welding, flux cored arc welding, submerged arc welding, plasma arc welding oxyacetylene welding, furnace fusing, thermal spray processes and their applications, hard facing metallurgy, fusion alloys, non fusion materials.

Hard facing in new designs, hard facing for repairs, hard facing with fusion processes, nonfusion deposits, weldability considerations, finishing considerations.

Specifications: Characterization and testing of surface coatings, factors affecting the choice of surface treatments.

Text and Reference Books:

1. Kenneth G. Budinski, Surface Engineering for wear Resistance, Prentice Hall Inc. New York.
2. D. S. Rickerby and A. Mathews, Advanced Surface Coatings, A Handbook of Surface Engineering, Blackie, New York.
3. M.G. Hocking, Metallic and Ceramic Coatings, Longman, London
4. A. Nicku-Laxi, Advances in Surface Treatments, led Oxford Pergamon, London
5. K.N. Strafford, P.K. Datta and J.S. Gray, Surface Engineering Practice, Processes. Fundamentals and Applications in Corrosion and Wear (eds), Ellis Harwood, London.