

SURFACE ENGINEERING FOR CORROSION AND WEAR RESISTANCE APPLICATION



METALLURGICAL AND MATERIALS ENGG.

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TYPE OF COURSE : New | Elective | UG/PG
INTENDED AUDIENCE : Metallurgical Engg., Mechanical Engg.,
Materials Science and Physics
COURSE DURATION : 12 weeks (28 Jan'19-19 Apr'19)
EXAM DATE : 28 April 2019
PRE-REQUISITES : Materials Science and Engineering

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INDUSTRIES APPLICABLE TO : Tata Steel, Jamshedpur, Tata Metallica, Kharagpur, R&D Center for Iron and Steel (RDCIS), Ranchi,

COURSE OUTLINE :

Wear and corrosion are the major causes of degradation of engineering components for structural applications. Among different ways of minimizing the probability of failure of components by wear or corrosion or improving its lifetime is by optimum designing of surface, may be termed as surface engineering. However, the properties achieved on the surface depend on the techniques to be applied, process parameters to be chosen and the surface characteristics (surface roughness, microstructure and composition) achieved thereafter.

ABOUT INSTRUCTOR :

Prof. Majumdar is well known internationally for her research contribution in the field of Metallurgical and Material Engineering with focus on surface engineering and laser surface processing. She made fundamental contributions to a profound understanding of the metallurgy of rapid solidification of metals under the specific heat input of a laser source. Her works also concern a detailed structure-property correlation

Prof. Manna is a renowned academician and prolific researcher with wide ranging research interests concerning microstructure-property-parameter correlation in nanometric and amorphous solids, laser and plasma assisted surface engineered components, bainitic and ODS steel and nano-fluid.

COURSE PLAN :

- Week 01** : Introduction to materials, surface, thermodynamics of surface, surface dependent engineering properties
- Week 02** : Common surface initiated engineering failure; mechanism of surface degradation
- Week 03** : Role of microstructure and materials behavior in controlling the surface dependent failure of components, importance of surface engineering, classification and scope of surface engineering of Materials. Introduction to surface modification and coating techniques.
- Week 04** : Conventional surface modification methods: flame hardening, induction hardening, carburizing, nitriding, diffusion assisted surface alloying.
- Week 05** : Advanced surface modification methods: Laser, Plasma and electron beam assisted surface modification. Advanced surface modification methods
- Week 06** : Surface Coating by Chemical/electro-chemical Routes Electro/electroless deposition, anodizing, micro-arc oxidation
- Week 07** : Surface Coating by Physical Routes: Physical vapor deposition, pulsed laser deposition, cathodic arc evaporation.
- Week 08** : Surface Coating by chemical Routes: Chemical vapor deposition, laser assisted chemical vapor deposition.
- Week 09** : Hot dipping, (galvanizing, tinning, aluminizing, babitting, etc.)
- Week 10** : Thermal Spraying (flame spraying, HVOF spraying, wire arc spraying, kinetic spraying)
- Week 11** : Weld overlaying, laser surface cladding
- Week 12** : Surface characterization and Testing