Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NMED518	Surface Engineering	3	0	0	3

Course Objective
To have systematic and comprehensive understanding on various aspects related with surface engineering of metallic components.
Pre-requisite:
Students must had studied materials science related subject in undergraduate.
Learning Outcomes
Upon successful completion of this course, students will be able to: • Identify and design the suitable surface modification methods for different applications • Characterise the metallurgical, mechanical and tribological properties of engineered surfaces.

Module	Topics	Lecture Hours	Learning Outcome
1	Fundamentals of surface engineering: definition, scope, classification, and general principles, surface dependent properties and failures, Surface and surface energy: Structure and types of interfaces.	4	Understanding of surface properties and their influences on the performance of a component.
2	Conventional surface engineering practice: Surface engineering by material removal: like etching, grinding, polishing, etc. Surface engineering by material addition: like hot dipping, Electro-plating, carburizing, Cyaniding, etc.	6	Understanding on the fundamental of basic surface modification techniques.
3	Surface engineering by energy beams: Laser assisted microstructural modification like surface melting, hardening, shocking etc., Laser assisted compositional modification like surface alloying, surface cladding, composite surfacing etc.	10	Understanding of thick layer coating technology and their applications.
4	Surface engineering by spray techniques like Flame spray, cold spray etc.,	5	Understanding of advanced coating processes
5	Ion beam assisted microstructure and compositional modification, Sputter deposition of thin films & coatings, PVD coating processes, Chemical vapour deposition and PECVD.	10	Understanding of thin layer coating technology and their applications.
6	Characterization of coatings and surfaces: Measurement of coatings thickness, porosity & adhesion of surface coatings, Measurement of residual stress & stability, Surface microscopy, topography and Spectroscopic analysis of modified surfaces.	7	Understanding about methods of characterization needed for evaluating the metallurgical, mechanical and tribological properties of engineered surfaces.
	Total	**42**	

Text books:

1. Introduction to Surface Engineering by P. A. Dearnley, Cambridge University Press, 2017
2. Laser surface modification of alloys for corrosion and wear resistance by Chi Tat Kwok, Woodhead Publishing Limited, 2012

References:

1. Surface Engineering for Corrosion and Wear Resistance by J.R. Davis, ASM international , 2001

2. ASM Hand book – Surface Engineering, ASM International, vol. 5, 9th edition, 1994
Surface Engineering for Wear Resistances by K.G. Budinski. Prentice Hall

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