

<b>18MTOE02</b>		<b>SURFACE ENGINEERING</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>Course Objectives:</b>							
1.	Analyze the various concepts of surface engineering and comprehend the design difficulties						
<b>UNIT I</b>	<b>TRIBOLOGY AND PLATING PROCESSES</b>			<b>9</b>	<b>+</b>	<b>0</b>	
Introduction to tribology, Wear: Types of wear - adhesive, abrasive, oxidative, corrosive, erosive and trotting wear, roles of friction and lubrication and wear testing. Plating Processes: Fundamentals of electrodeposition, plating of nickel, chromium, tin and copper, pulsed plating, hydrogen embrittlement, plating adhesion, electroless plating, electrochemical conversion coating, selective plating for repair, plating properties, hard anodizing.							
<b>UNIT II</b>	<b>HARD FACING PROCESSES</b>			<b>9</b>	<b>+</b>	<b>0</b>	
SMAW, GTAW, GMAW, FCAW, SAW, PAW, Oxy-Acetylene Welding, Furnace fusing, Thermal-spray, name spray processes - HVOF, Detonation gun and jet kote processes, hard facing consumables.							
<b>UNIT III</b>	<b>SPECIAL DIFFUSION PROCESSES</b>			<b>9</b>	<b>+</b>	<b>0</b>	
Principle of diffusion processes - Boriding, Aluminising, Siliconising, Chromising - Selection of diffusion processes - Characteristics of diffused layer - micro structure and micro hardness evaluation - properties and applications.							
<b>UNIT IV</b>	<b>THIN FILM COATINGS</b>			<b>9</b>	<b>+</b>	<b>0</b>	
Physical vapour deposition processes - Thermal evaporation - sputter coating - Ion plating - Chemical vapour deposition - reactive sputtering - TiC, TiN, Alumina, CBN, Diamond and DLC coatings. Structure, properties and applications.							
<b>UNIT V</b>	<b>HIGH ENERGY MODIFICATION AND SPECIAL PROCESSES</b>			<b>9</b>	<b>+</b>	<b>0</b>	
Electron beam hardening, glazing, Laser beam hardening glazing ion implantation, Composite surface created by laser and Electron beam. Surface cements, Wear tiles, Electro spark deposition, fused carbide cloth, thermal / chemical. Ceramic coatings, centrifugal cast wear coatings, Wear sleeves and Wear plates.							
<b>Total (L+T) = 45 Hours</b>							
<b>Course Outcomes:</b>							
Upon completion of this course, the students will be able to:							
CO1	:	Understand the influence of the tribological characteristics and improvise the material property by the plating process					

CO2	:	Explain the various hard facing processes
CO3	:	Enhancement of surface properties with diffusion of foreign atoms into the outer surface of the material such as boriding, aluminizing, etc
CO4	:	Describe the various vapour deposition processes of different materials on the surface of native materials using the Chemical, Physical and Thermal vapour deposition processes.
CO5	:	Describe the Modern processes and high energy processes like electron beam hardening, laser beam hardening.
<b>Text Books:</b>		
1.		Chattopadhyay R., Surface Wear: Analysis, Treatment, Prevention, ASM International, USA, 2001
2.		Kenneth G. Budinski, Surface Engineering for Wear Resistance, Prentice Hall, Englewood Cliff, 1990.
<b>Reference Books:</b>		
1.		ASM Metals Handbook, Vol 5: Surface Engineering, ASM International, Ohio, 1994.
2.		Ernest Rabinowicz, Friction and Wear of Materials, 2nd ed., John Wiley & Sons, NY, 1995.
3.		Davis J.R., Surface Engineering for Corrosion and Wear resistance, ASM International, 2001.