



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163907

THIN FILM TECHNOLOGY

6<sup>th</sup> SEMESTER

**Type of course:** Coating Technology

**Prerequisite:** Basic knowledge of Nanoscience and Chemistry

**Rationale:** To make the students understand the impact of nanotechnology based coating and its application in the industries.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	<b>CONCEPT OF COATING</b> 1.1 Introduction to surface Engineering, 1.2 Differences between surface and bulk 1.3 Properties of surfaces-wear 1.4 wettability	09	16%
2	<b>SPECIAL COATING TECHNIQUE</b> 2.1 Electroplating and electrolessplating , 2.2 Metallic and nonmetallic coatings 2.3 Galvanizing 2.4 Advantages and Disadvantages - conventional verses nanocoatings	10	23%
3	<b>HARD AND SOFT COATINGS</b> 3.1 Laser cladding, 3.2 Laser alloying, 3.3 Electron beam hardening, 3.4 Electrophoretic deposition, 3.5 DLC and diamond coatings, 3.6 antifriction and antiscratch coatings	10	21%
4	<b>SURFACE COTING</b> 4.1 Conductive Coatings, 4.2 Sol-Gel Coatings, 4.3 Radiation-Cured Coatings, 4.4 Metal Coating	11	23%
5	<b>APPLICATION OF NANOCOATING</b> 5.1 Introduction 5.2 Conventional coating technologies for the automotive and aerospace industries 5.3 Advanced coating technologies for the automotive and aerospace industries	09	17%



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	5.4 Packaging applications 5.5 Coatings for the electronics and sensors industry 5.6 Paints and enamels industry 5.7 Biomedical implants industry		
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## Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
Remembrance R Level	Understanding U Level	Application A Level	Analyze N Level	Evaluate E Level
30	35	35	0	0

**Legends: R: Remembrance; U = Understanding; A = Application and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

## Reference Books:

1. COATINGS TECHNOLOGY HANDBOOK  
MARCEL DEKKER, INC., by D. Satash, Arthur A. Tracton (chapter 1,2,3)
2. SURFACE ENGINEERING OF METALS, PRINCIPLES, EQUIPMENTS AND TECHNOLOGIES (chapter 4,5)  
Tadeusz Burakowski, Padeusg and Weirzxhon, CRC press, 1998  
Kwaadsteniet, Marelize Botes and J.Manuel Lopez-Romero.
3. SURFACE COATINGS FOR PROTECTION AGAINST WEAR  
edited by BG Miller, Woodhead publishing, -2006, Caister Academic Press by T.Eugene, Michele de
4. NANOCOATINGS: PRINCIPLES AND PRACTICE  
DesTech Publications, inc., by Steven Abbott, Nigel Holmes
5. NANOCOATINGS AND ULTRA-THIN FILM  
A.S.H. Makhlof and I. Tiginyanu A volume in Woodhead Publishing Series in Metals and Surface Engineering



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## Course Outcome:

After a successful completion of the course, students should be able to

1. Discuss the differences and similarities between different vacuum based deposition techniques,
2. Asses the relation between deposition technique, film structure, and film properties.
3. Discuss typical thin film applications

## List of Experiments:

### Experiment 1

To make polymer coating on glass substrate.

### Experiment 2

To make metal coating on glass substrate.

### Experiment 3

To measure the conductivity of metal coating.

### Experiment 4

To coat the zinc on iron washer and measure the mass,dimension,area and measure the thickness of zinc coating.

### Experiment 5

Study the corrosion resistive properties of the coating materials.

### Experiment 6

Study the wear resistance of coating surface.

### Experiment 7

Comparision of films deposited by spray coating and spin coating.

### Experiment 8

Study the dip time effect on properties of coating using dip coater.

## Major Equipment:

1. Wheighitng machine.
2. Dip Coater machine, Spray coater machine
3. Surface roughness tester
4. Vernier calipers, micrometer screw gauge.
5. Necessary Chemicals, glassware and different type of substrate for coating technology.

## List of Open Source Software/learning website:

<http://www.nanotech-now.com/academic.htm#study>