GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39)
COATING TECHNOLOGY
SUBJECT CODE: 2163901
B.E. 6th 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	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	CONCEPT OF COATING Introduction to surface Engineering, Differences between surface and bulk, Properties of surfaces-wear,wettability	09	16%
2	SPECIAL COATING TECHNIQUE Electroplating and electroplating ,Metallic and non metallic coatings, Galvanizing,advantages and disadvantages - conventional verses nanocoatings	10	23%
3	HARD AND SOFT COATINGS Caser cladding, laser alloying, Electron beam hardening, ion beam implantation, electrophoretic deposition, DLC and diamond coatings, antifriction and antiscratch coatings	10	21%
4	SURFACE COTING Conductive Coatings,Sol-Gel Coatings,Radiation-Cured Coatings,Metal Coating	11	23%
5	CHARACTERIZATION TECHNIQUE AND APPLICATION OF NANOCOATING	09	17%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
17	22	21	10	00	00

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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
2. Surface engineering of metals, principles, equipments and technologies 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. makhlouf and i. Tiginyanu a volume in woodhead publishing series in metals and surface engineering

Course Outcome:

After learning the course the students should be able to:

1. To notify the learner about the various coatings on different area.
2. To know about nanostructured coating techniques..
3. To have knowledge about the coating technique with different type of the surfaces.

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.

Design based Problems (DP)/Open Ended Problem:
Open Ended /design based project: Apart from above experiments a group of students (Maximum Three) has to undertake one open ended problem/design problem. **(Students are free to select any area of science and technology may be based on their branch to define the project)**

Aims:

1. To provide experience in laboratory based experimentation, data recording and analysis and drawing of conclusions.
2. To develop report writing skills for scientific material
3. To develop the ability to undertake investigations where, as part of the exercise, the goals and methods have to be defined by the investigator.
4. To develop skills in literature searches and reviews.

Evaluation of Open ended / design based small project:

1. Open ended / design based small project will be evaluated by external examiners with appropriate marks allotment given by GTU time to time.
2. Faculties should cultivate problem based project to enhance the basic mental and technical level of students.
3. Evaluation should be done on **the approach of the student on his/her efforts** (not on completion) to study the design module of giving task.

Examples:

1. Different type of parameters for different type of coating materials.
2. Determination of the anti-corrosion material with surface roughness in each coat material.
3. Determination of best coating technique for different kind of surfaces.
4. Enhance the properties of the surfaces.
5. Find out the coating application in medical implantation.

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

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.