GUJARAT TECHNOLOGICAL UNIVERSITY

NANO TECHNOLOGY (39)
NANOLITHOGRAPHY
SUBJECT CODE: 2183901
B.E.8th SEMESTER

Type of course: Synthesis of Nanomaterials, Thin Film Devices, Coating Technology, Characterization Technique

Prerequisite: Physics of Nanomaterials, Characterization of Nanomaterials, Coating Technology, Thin Film Technology

Rationale: To make the students understand the newly developed fabrication, physics and chemistry of multilayered devices.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	0	3	70	20	10	0	0	0	100

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	**PHOTORESISTS** Positive and Negative Resists, Adhesion Promotion, Resist Spin Coating, Resist Soft Bake and Hard bake, Photochemistry of Resists, Acid-Catalyzed DUV Resists	**8**	**17%**
2	**NANOIMPRINT LITHOGRAPHY** From Printing to Nano imprint, Fabrication of Mold, Separating Mold and Resists after Imprint, Residual Layer Thickness Measurement	**12**	**25%**
3	**X-RAY LITHOGRAPHY (XRL)** Irradiation system for XRL, High Resolution and Deep XRL, Examples of X-ray lithography beamlines, Physics of X-ray lithography	**10**	**21%**
4	**MATROLOGY FOR LITHOGRAPHY** The concept of CD in metrology, Grating optical diffractometry or scatterometry	**10**	**20%**
5	**WHAT IS MOST SUITABLE TECHNIQUE FOR LITHOGRAPHY?** Technique Correlation, Technique Calibration, Process Development, Evaluation of Morphological Damage Generated by the Primary Electron Beam from CD-SEM	**8**	**17%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**33**	**15**	**7**	**-**	**-**

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. **NANOLITHOGRAPHY** M Feldman (Editor), ISBN: 9780081014042, Elsevier, Imprint: Woodhead Publishing, 13th November 2013.
2. **MICROFABRICATION AND NANOMANUFACTURING** Mark J. Jackson, Taylor & Francis, 2006.
3. **SPRINGER HANDBOOK OF NANOTECHNOLOGY** Bharat Bhushan (Editors), DOI:10.1007/978-3-642-02525-9, Springer-Verlag Berlin Heidelberg, 2010.
4. **NANOLITHOGRAPHY** Stefan Landis (Editor), ISBN: 978-1-84821-211-4, Wiley-ISTE, 2011

Course Outcome:

After learning the course the students should be able to:
1. To notify the learner about the various type of lithography technique.
2. To understand about fabrication of devices.
3. To understand about which lithography technique is best for devices.

List of Open Source Software/learning website:

http://www.intechopen.com/books/lithography

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.