Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019 - 2020

Course Handout Part II

06.01.2020

In addition to Part I (general Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : PHY F379
Course Title : Thin film technology
Instructor - in - charge : B. Harihara Venkataraman

Course Description: This course provides an overview of thin film technology - Basics of vacuum deposition systems, Thin film deposition techniques, Kinetics and diffusion mechanisms, Surface nucleation and film growth, Structure and morphology of thin films, Ferroelectric and magnetic properties of thin films and their applications.

Scope & Objective:

- The course introduces the concepts in vacuum deposition techniques, nucleation and growth of thin films.
- Techniques to characterize thin films and a discussion on some of the physical properties of thin films.

Text Book: There is no single textbook exists to cover the learning objectives of this course. Lecture notes will be provided for all the topics to be covered in the handout.

Reference Books:

- Materials Science of Thin Films - Milton Ohring, 2nd Edition (Elsevier)
- A User's Guide to Vacuum Technology - J.F. O' Hanlan
- Thin film deposition principles and practice - Smith Donald
- Thin Film Phenomena - Kasturi L Chopra (McGraw - Hill)

Course Plan:

Lecture No.	***Learning Objectives***	***Topics to be covered***	***Chapter in the Text Book***
1 - 3	A review of Materials Science	Structure, Defects in Solids, Bonds and Bands in Materials, Thermodynamics of Materials, Kinetics and Nucleation.	Lecture notes as well as relevant portions from the

4 - 8	Thin film deposition techniques	Different CVD and PVD techniques, brief differences between CVD and PVD techniques, evaporation rate processes, evaporation of multielement materials and alloys, discussion on vacuum deposition systems.	listed reference books

9 - 13	Film thickness uniformity and purity	Thickness measurement techniques, deposition geometry, thickness uniformity.	
14 - 20	Nucleation and growth of thin films	Thermodynamic aspects of nucleation and growth - capillarity theory of heterogeneous nucleation, atomistic theory, growth modes.	
21 - 28	Characterization of thin films	Structural techniques (XRD), imaging techniques (SEM/TEM) / chemical techniques.	
29 - 34	Physical Properties of thin films	Dielectric, ferroelectric and magnetic/mechanical properties.	
35 - 40	Applications of thin films	Sensors, solar cells & multiferroics.	

Evaluation Scheme:

EC No.	Evaluation Scheme	Duration	Weightage (%)	Date & Time	Nature of Component
1.	Midsem Examination	90 min	35 %	6/3 1.30 -3.00 PM	Closed Book
2.	Quiz/Seminar	30 - 40 min	20 %		Open Book
3.	Comprehensive Examination	3 hours	45 %	13/05 FN	Closed Book

Notices: Notices for the course will be displayed on **Physics** notice board.
Make-up Policy: Make up will be granted only for serious medical emergencies. No make-up for Quiz / Seminar.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge

PHY F379