

## Thin film technology for electronics and optoelectronics devices

Semester : **6th**Course : **Other Elective**Credits : **3**Hours : **3**

### Course Context and Overview (100 words):

A thin film is a layer of material ranging from fractions of a nanometer (monolayer) to several micrometers in thickness. In addition to their applied interest, thin films play an important role in the development and study of materials with new and unique properties.

In this innovative course, the students will have the basic knowledge for the growth of thin film employed for the fabrication of various electronics and optoelectronics devices used for the different applications. This course also deals with the different electronic, optical, structural, magnetic and mechanical properties of the thin films, which are different from the bulk and thick films

### Prerequisites Courses:

Nil

### Course outcomes (COs):

<b>On completion of this course, the students will have the ability to:</b>
CO1 Basic of the thin film technology
C02 The students will acquire the knowledge of different methods employed to the deposition of the thin films
C03 The students will be able to understand the different characterization scientific instrument and along with their basic principle to characterize the thin film
C04 The students will be able get information about the different properties of thin films and differentiate between the property observed in the thick, bulk and thin films
CO5 Applications of thin film in different fields

**Course Topics:**

<b>Topics</b>	<b>Lecture hours</b>
<b>Introduction</b> Basic principles of thin films and nanostructures, role of thin films in the semiconductor devices, General features for growth and structures of films, theories	5
<b>Fabrication of thin films</b> Sol-gel synthesis, spin coating, chemical vapor deposition, Physical vapor deposition, sputtering deposition, ion implantation, cathodic arc deposition, pulsed laser deposition, Atomic layer deposition, Electrolytic deposition, and molecular beam epitaxy	10
<b>Characterization of thin films</b> X-ray diffraction, Grazing incidence wide angle x-ray scattering (GIWAXS), UV-Visible spectroscopy, four probe resistivity, Scanning electron microscopy, Transmission electron microscopy, atomic force microscopy, squid, profilometer	10
<b>Properties of thin films</b> Structural, Mechanical, electrical, magnetic, optical and thermal properties, Interfaces and multilayer films	5
<b>Application of thin films</b> Application of thin films in different area such as electronics and optoelectronics devices, Batteries and super capacitors, medical, defence and automobiles (5 lectures)	5

Textbook references :

Text Book : K. L. Chopra, Thin Film Phenomena, McGraw-Hill (1983)

Reference books :

1. K. L. Chopra and I.J. Kaur, Thin Film Solar Cells, Plenum Press (1983).
2. L. I. Maissel and Glang (Eds.), Handbook of Thin film Technology, McGraw-Hill (1970).
3. J. J. Coutts, Active and Passive Thin Film Devices, Academic Press (1978).

Additional Resources: Research papers supplied by Instructor

**Evaluation Methods:**

Item	Weightage
Quizzes and Home assignments	15%
Midterm	30%
End term Examination	50%
Attendance	5%

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