# School of Physical Sciences M. Sc. – II

# Physics (Materials Science/ Condensed Matter Physics/ Energy Studies) SEC: Material Characterization Tools

#### Total Hrs: 60 (Theory-20 & Practical 40)

#### Chapter 1: Introduction to UV – VIS spectroscopy

Introduction, Fundamentals of spectroscopy, Instrumentation and principles of UV-VIS spectroscopy, qualitative and quantitative methodology, applications of UV-VIS spectroscopy.

#### **Chapter 2: BET – Principles and applications**

Introduction, Overview of BET theory, Instrumentation of BET, Type of Isotherm I to V, Calculations of multipoint BET, Calculations of single point BET, surface area calculation.

#### Chapter 3:Stylus (Surface) Profilometer

Introduction, Instrumentation and principal of working, Types – Contact profilometer, non-contact profilometer, time resolved profilometers, fiber based optical profilometers.

## Lab work(40)

- Absorption coefficient determination
- Band gap determination
- Functional group analysis
- Conjugation analysis
- Isotherm type determination
- Isotherm analysis
- Single point BET calculation,
- Pore size distribution calculation and analysis
- Multipoint BET calculation(Surface area calculation)
- Analysis of thin film
- Measurement of thickness
- Measurement of roughness

#### **Reference Book**

- 1. ENCYCLOPEDIA OF MATERIALS CHARACTERIZATION, C. Richard Brundle Charles A. Evans, Jr. Shaun Wilson, Manning Publications Co.
- 2. Advanced Characterization Techniques for Thin Film Solar Cells, Daniel Abou-Ras, Thomas Kirchartz, and Uwe Rau, WILEY-VCH Verlag GmbH & Co. KGaA,
- 3. Physical Methods for Materials Characterization, Second Edition, P E J Flewitt, R K Wild, Institute of Physics Publishing Bristol and Philadelphia
- 4. Characterization of Materials, Elton N. Kaufmann, Wiley Interscience.
- 5. Physical Methods in Chemistry and Nanoscience, Barron(Chapter 2 BET)

### 4 Credits

(6)

(8)

(6)