

Polymer Characterization

Undergraduate 3 credit course in Polymer Engineering curriculum

Amirkabir University of Technology

Chapter 1: Non-Instrumental Analysis: (Classification of Polymers, Polymer Additives, Sampling, Flame Test, Solubility Test, pH Measurement, Density measurement).

Chapter 2: Thermal Analysis: (Thermal gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), Differential Thermal Analysis (DTA), Thermal Mechanical Analysis (TMA), Dynamic Mechanical Thermal Analysis (DMTA))

Chapter 3: Chromatography Methods: (Thin-Layer Chromatography (TLC), Column Chromatography, High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Ion-Exchange Chromatography, Gel Permeation Chromatography (GPC)).

Chapter 4: Microscopy Analysis: (Optical Microscope, Electron Microscopes (Electron Material Interaction, Scanning Electron Microscopy (SEM), Environmental Scanning Electron Microscopy (ESEM), Transmission Electron Microscopy (TEM), Scanning Tunneling Microscopy (STM), Chemical Analysis and Electron Microscopes), Atomic Force Microscopy (AFM)).

Chapter 5: Investigating the Structure of Materials by X-ray Diffraction/Absorption; X-ray Fluorescence and Photoelectron Spectroscopy: (The nature of X-ray, X-ray Diffraction Spectroscopy (XRD), X-ray Absorption Spectroscopy (XAS), X-ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES), X-ray Fluorescence Spectroscopy (XRF)).

Chapter 6: Ion Scattering and Mass Spectroscopy: (Ion Scattering Spectroscopy (ISS), Secondary-Ion Mass Spectrometry (SIMS), Mass Spectroscopy (MS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS)).

Chapter 7: Vibrational Spectroscopy (Fourier-Transform Infrared Spectroscopy (FT-IR), Attenuated Total Reflectance Spectroscopy (ATR), Raman Spectroscopy, Nuclear Magnetic Resonance Spectroscopy (NMR)).

Chapter 8: Absorption, Emission or Scattering Spectroscopy of UV-Visible Light (UV-Visible Spectroscopy, Molecular Luminescence Spectroscopy, Dynamic Light Scattering (DLS), Atomic Absorption Spectrometry (AAS)).

References:

1. Campbell, Dan, Richard A. Pethrick, and Jim R. White. *Polymer characterization: physical techniques*. CRC press, 2014.
2. Stuart, Barbara H. *Polymer analysis*. John Wiley & Sons, 2008.
3. Cheremisinoff, Nicholas P. *Polymer characterization: laboratory techniques and analysis*. William Andrew, 1996.