

Important Announcement



IIM

Metallurgy
Materials Engineering

To all members appearing at Part II AMIIM Exams

Dear Members,

This is to inform you that on recommendation of IIM Examinations & Education Committee, your Council has approved inclusion of Materials Characterization and Secondary Steel Making & Casting Processes as elective papers, which will be effective from June 2017.

Syllabus of Materials Characterization (Group E in place of Powder Metallurgy)

Optical Microscopy

Basic terminology : Diffraction of light, Resolution & Magnification.

Typical Optical microscope: optical path, illumination system (collector & condenser), objective lens, eyepiece.

Optical contrasting techniques: Bright-field, dark-field, Polarization contrast and differential Interference contrast.

Quantitative Metallography: Grain size estimation (ASTM standard) and volume fraction of second phase.

X-Ray Diffraction

Properties of X-rays: Production of x-rays, continuous & characteristic X-rays, & filters.

Diffraction of X-rays by crystalline materials: Bragg's law.

Diffractometer & Debye Scherrer camera for diffraction experiments and collection of diffraction data.

Intensities of Diffracted X-Rays: Scattering by an electron, an atom & a unit cell, structure factor, six factors affecting the relative intensity of the diffraction peaks.

Indexing of powder diffraction pattern of a cubic system (SC, BCC, FCC & Diamond Cubic structures).

Determination of precise lattice parameters, strain and crystallite size from powder diffraction data.

Scanning Electron Microscopy

Basic Construction of a SEM and its various parts. Typical operating voltage.

Signals generated during interaction of electron with solid surfaces – Elastic & inelastic scattering; resolution, magnification, depth of field and depth of focus.

Imaging techniques in a SEM: Secondary electron and back scattered electron.

Chemical Analysis by Energy Dispersive X-ray Analysis (EDX) technique.

Transmission Electron Microscopy

Basic construction of a TEM and its various parts. Typical operating voltages.

Resolution and its relation with voltage, magnification.

BF, DF and SADP and chemical analysis by EDX.

Sample Preparations: Powder and Thin foils for TEM observation.

References:

Metallographic Laboratory Practice by G. L. Kehl, Eurasia Publishing House, New Delhi.

Optical Microscopy of Metals by R.C. Gifkins, Pitman.

Modern Metallography by R.E. Smallman and K.H.G. Ashbee, Pergamon press.

Elements of X-ray Diffraction, Second Edition by B.D. Culity, Addison-Wesley.

Electron Microscopy & Analysis, 3rd Edition by Peter Goodhew, John Humphreys & Richard Beanland, Taylor and Francis.

An Introduction to Materials Characterization by P.R Khangaonkar, Penram International publishing, India.

Materials Characterization by P.C. Angels, Elsevier.

Materials Characterization Techniques by (editor) G. Sridhar, et al. National Metallurgical Laboratory, Jamshedpur.

Electron Microscopy in the Study of Materials by P.J. Grundy and G.A. Jones, Edward Arnold.

Transmission Electron Microscopy by D.B. Williams and C.B. Carter, Plenum Press.

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