



X-RAY CRYSTALLOGRAPHY & DIFFRACTION

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INTENDED AUDIENCE : Undergraduate students of Metallurgical and Materials, Physics, Chemistry and biological sciences

INDUSTRIES APPLICABLE TO : All the Metallurgical and automotive industries will be interested in this course

COURSE OUTLINE :

The properties of any crystalline material are very much functions of its crystal structure and internal arrangement of atoms. X-ray diffraction is an elegant method to determine crystal structure and related parameters. This course provides a glimpse of how X-ray diffraction can be used to solve various crystallographic problems of both single and polycrystalline materials, starting from an elementary level.

ABOUT INSTRUCTOR :

Prof. R. K. Ray is presently a Visiting Professor in the MN Dastur School of Materials Science and Engineering, IEST Shibpur. Previously he was a Professor of Materials and Metallurgical Engineering in IIT Kanpur and a Visiting Scientist and Consultant in the R&D Division of Tata Steel Jamshedpur. His research interests are crystallographic textures of materials, advanced high strength steels, structure and properties of materials, etc.

Prof. S. Sankaran is currently a Professor in the Department of Metallurgical and Materials Engineering at Indian Institute of Technology Madras. His research interests are deformation processing of materials, mechanical behavior of materials and electron microscopy. He is also presently the faculty in-charge of central electron microscopy of IIT Madras.

COURSE PLAN:

Week 1: Geometry of Crystals

Week 2: Reciprocal Lattice, Stereographic Projection

Week 3: Point Groups and Space Groups

Week 4: Point Groups and Space Groups (Cont'd), Basics of X-Rays, Production and Detection of X-Rays

Week 5: Principles of X-Ray Diffraction, X-Ray Diffraction Methods, Diffractometer Measurements

Week 6: Intensity of Diffracted Beams

Week 7: Determination of Crystal structures, Precise Lattice Parameter Determination

Week 8: Phase Diagram Determination, Ordered Disordered Transformation

Week 9: Qualitative Phase Analysis, Quantitative Phase Analysis 1

Week 10: Chemical Analysis by X-Ray Fluorescence, Chemical Analysis by X-Ray Absorption, Effect of Crystallite Size on Diffracted X-Ray Intensity

Week 11: Stress Analysis by X-Rays

Week 12: Determination of Single Crystal Orientation by X-Rays