MATERIAL CHARACTERIZATION

PRE-REQUISITES : Nil
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 :
It is the first course at the under graduate level on microstructural characterization of materials. This course will cover the basic principles and techniques of X-ray diffraction, optical, scanning electron and transmission electron microscopy along with demonstrations of the instrument details and imaging experiments through videos. This course also deals with the sample preparation techniques for the microstructural analysis with practical examples through videos.

ABOUT INSTRUCTOR :
Prof. S.Sankaran is presently Associate Professor in the Department of Metallurgical and Materials Engineering, IIT 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: Fundamentals of optics
Week 2: Variants in the optical microscopes and image formation
Week 3: Sample preparation and applications of optical microscopes
Week 4: Introduction to Scanning electron microscopy (SEM)
Week 5: Instrumental details and image formation of SEM
Week 6: Various imaging techniques and spectroscopy
Week 7: Fundamentals of X-ray scattering
Week 8: Crystallite size, effect of strain on the intensity
Week 9: Quantitative analysis, residual stress analysis
Week 10: Introduction to transmission electron microscopy (TEM)
Week 11: Diffraction and image formation
Week 12: Sample preparation and applications of TEM