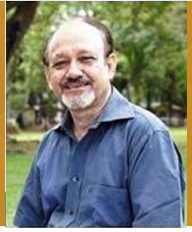

BASIC REAL ANALYSIS

PROF. I. K. RANA

Department of Mathematics

IIT Bombay

PRE-REQUISITES : Basic Calculus exposure
INTENDED AUDIENCE : Any discipline, with proper exposure to Calculus.
INDUSTRIES APPLICABLE TO : All

COURSE OUTLINE :

This is first course in Real Analysis. The aim of the course is to over the basic concepts like Real line, Topological concepts of real line, differentiation and integration with applications. Introduction to calculus of several variables.

ABOUT INSTRUCTOR :

Prof. I. K. Rana Emeritus Fellow at Department of Mathematics, IIT Bombay. I have taught couses at B.Tech, M.Sc., and Ph.D level for the last 34 years

COURSE PLAN :

Week 1 : Review of sequences and series of real numbers.
Week 2 : Tests for convergence of Series. Limit superior and limit inferior.
Week 3 : Cauchy sequences and completeness of R.
Week 4 : Basic notions of Metric Spaces with emphasis on Rn. Connectedness, Compactness, and Heine Borel Theorem.

Week 5 : Continuity and Uniform continuity.
Week 6 : Monotone functions and functions of bounded variation.
Week 7 : Derivatives. Mean Value Theorem and applications
Week 8 : Riemann Stieltjes integral. Riemann`s Criterion for integrability. Improper integrals and the Gamma function.

Week 9 : Sequences and series of functions. Uniform convergence.
Week 10 : Functions of several variables: Directional derivative, partial derivative, total derivative,
Week 11 : Mean Value Theorem, Taylor`s Theorem and applications to Maxima/Minima and convexity.
Week 12 : Double and triple integrals. Statement of Fubini's Theorem and change of variable formula (without proofs) with illustrations.