DEALING WITH MATERIALS DATA: COLLECTION, ANALYSIS AND INTERPRETATION

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PRE-REQUISITES : An exposure to R is preferable; a basic engineering mathematics or mathematical methods course is preferable

INTENDED AUDIENCE : Students of materials science, materials engineering, metallurgy, ceramics engineering, polymers and any other student (such as physics, chemistry, mechanical engineering etc) who is interested in materials data

COURSE OUTLINE :
This course is an introductory course with hands on sessions in R on some basic aspects of materials data. The course will cover all aspects, namely, data collection, analysis and interpretation. All the concepts will be covered with materials data and the hands-on sessions will be conducted using R programming language.

ABOUT INSTRUCTOR :

My research interests are in modelling microstructural evolution. My teaching interests, among other things, include physical metallurgy, phase transformations, computational methods, simulation and optimization, modelling, mathematical methods and data analysis and interpretation. I am also interested in using mathematical and computational techniques to solve materials problems of academic interest and industrial importance as well as introducing open source software to materials scientists / metallurgists.

Prof. Gokhala is statistician by education and have 25 years of experience of working in Defence Metallurgical Research laboratory. Her experience ranges from analysis of materials data for certification, research and life estimation technologies to training metallurgists for variety of statistical tools such as Design of Experiments and Analysis, Regression Analysis, Analysis of Variance, Neural Networks and Genetic Algorithm, Statistical Modeling and Monte Carlo simulation.

COURSE PLAN :

Week 1**:** Introduction: basic probability and statistics

Week 2**:** Introduction: basic R

Week 3**:** Presenting data: inaccuracies and error and its propagation

Week 4**:** R for descriptive data analysis

Week 5**:** Probability distributions

Week 6**:** Probability distributions using R

Week 7**:** Processing of experimental data using R

Week 8**:** Fitting functions to data: regression, testing significance of fit

Week 9**:** R for graphical handling of data and fitting

Week 10**:** Basics of design of experiments

Week 11**:** Bayesian inference and its uses

Week 12**:** Case studies using R