Data and error analysis using R

Course Title	**Data and error analysis using R**
Course Category	**Pedagogy / Generalized skills**
Relevant Discipline(s)	**Metallurgy / Materials Science: could be relevant also to Physical sciences, mechanical engineering, chemical engineering and civil engineering**
Duration of course in equivalent integer no. of days (min 3 days, 1 day = 6 hrs of lectures/hands on sessions)	**3 days**
Proposed dates	**4,5,6,11,12,13 of December, 2020** **Time slot: 3 pm to 6 pm on these dates**

Brief Course Description and Course Contents

The skill of analysing data obtained from experiments and simulations and presenting them in an appealing manner and without over simplification is essential for any student or practitioner of science and engineering. In this course, we will use the R programming language as the tool to carry out the analysis and generate graphs / figures / plots of the data. Specifically, the course will be hands-on; the lecture component will not be more than 30%. The remaining time will be spent on working on data sets together and learning to analyse.

The following are the specific skills we are aiming for:

(1) How to: report physical quantities along with the uncertainties
(2) How to: classify and propagate errors
(3) How to: process experimental /simulation data
(4) How to: handle data with errors graphically
(5) How to: fit functions to data
(6) How to: carry out calibration

(7) How to: meta-analyse literature data -- a case study of Hall-Petch effect

(8) How to: identify and avoid common mistakes in dealing with data

In all cases, we will take real life data (from metallurgy / materials science) and carry out the analysis using R. However, the principles are common to all science and engineering disciplines and the methodology and the codes could be useful for both teaching and for research. We will also share the curated data sets that we use for the analysis with the participants – so that they can use it in their own teaching. Finally, either during or after the course, the participants can bring their own data and problems and discuss methods of analysis and solution.

Instructor Details			
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