

Module Title: Measuring Variability and Error Propagation
Module Code: DA0101
Maximum Number of Students: 30
Total ECTS Credits 2
Notional Learning Hours (a) Contact Time - 12 h (b) Private Study - 38 h Format of Teaching: Lectures 8 h Laboratories or Practicals 4 h Other 0 h Teaching Strategy: 8 h of formal lectures in 60-120 min timetable. 4 h of exercise classes in 60-120 min timetable
Convener: Isabel Cavaco
University / Department: Universidade do Algarve /DQBF
Language of Tuition: English
Module Description - The Purpose or Aims: This module trains students to work with random and systematic deviation. It introduces the basic concepts in statistics: data variability, the concept of probability and probability distributions. It describes how to estimate the mean and standard deviation of a population from small sets of data, and how to propagate these deviations when experimental results are used in calculations. It also introduces the concept of control charts, how to build them and how to apply them in analytical laboratories.
Specific Learning Outcomes for this module: (contributing to general learning outcomes GLO 1 – GLO 10) At the end of the module, the learner is expected to be able to: <ol style="list-style-type: none"> 1. Choose the best parameters to describe a given set of data 2. Estimate the confidence interval of a result from a limited set of repeated experiments 3. Estimate the confidence interval of a value calculated from several experimental variables. These LO contribute to GLO 2, 4, 5, 6, 7, 8 and 9.
Summary of Course Content: Deviations in experimental results: random, systematic and gross. How to measure and how to minimize random and systematic deviations. Parameters for measuring data dispersion. Parameters for measuring data location. The concept of probability and the role of statistics in Quality Control. Random distributions. Gaussian distribution. The Central Limit Theorem. Confidence intervals. Propagation of random and of systematic errors.

Transferable Skills Taught:

Using MS Excel for simple calculations with large sets of data.

Assessment Methods:

1. Written examination / assignment (100%)

Assessment Criteria:Threshold:

To calculate and correctly present confidence intervals from simple sets of experimental data.

Good:

To estimate and correctly present confidence intervals for complex variables calculated from several experimental variables.

Excellent:

To choose the best parameters to describe unusual sets of data, and to estimate and correctly present confidence intervals for such results.

Resource Implications of Proposal and Proposed Solutions:

Lecture notes will be available to students

Recommended reading:

“Peter C. Meyer, Richard E. Zund, “Statistical Methods in Analytical Chemistry”, 2nd. Ed., John Wiley & Sons, 2000.

“James N. Miller, Jane C. Miller, “Statistics and Chemometrics for Analytical Chemistry”, 4th ed., Prentice Hall, 2000.

Pre-Requisites: