



QUANTITATIVE METHODS IN CHEMISTRY

PROF. AASHEESH SRIVASTAVA

Department of Chemistry
IISER Bhopal

TYPE OF COURSE : Rerun | Elective | UG
COURSE DURATION : 12 weeks (25 Jan' 21 - 09 Apr' 21)
EXAM DATE : 25 Apr 2021

PROF. BHARATHWAJ SATHYAMOORTHY

Department of Chemistry
IISER Bhopal

PRE-REQUISITES : Basic Chemistry courses, basic Mathematics from school, 10+2 standard

INTENDED AUDIENCE : 3 rd year B.Sc./3 rd year BS-MS

COURSE OUTLINE :

This course aims to train students towards appropriate scientific reporting of the experimental data and testing hypothesis using statistical analyses. It emphasizes on reproducibility of experiments and the sources of "errors" during repetitions of experiments, how to quantify and minimize wherever feasible. In the later part, it deals with the principles of volumetric analysis, separation techniques employed for chemicals and biomolecules. Principles of instrumentation techniques will also be discussed.

ABOUT INSTRUCTOR :

Dr. Aasheesh Srivastava is currently the Head, Department of Chemistry, IISER Bhopal. He secured his Ph.D. in the field of Bio-organic Chemistry and has experience in the research of bio-inspired materials during his postdoctoral stint.

Dr. Bharathwaj Sathyamoorthy secured his Ph.D. in the field of Bio-physical Chemistry and is a solution-state Nuclear Magnetic Resonance (NMR) spectroscopist by training.

COURSE PLAN :

Week 1: Chemical stoichiometry, parameters to define concentration of chemicals

Week 2: Measurements and its statistical analyses

Week 3: Classification and sources of errors, error propagation, scientific reporting data

Week 4: Hypothesis validation

Week 5: Sampling, fitting and analysis of data

Week 6: Software-based data analysis (linear and non-linear regression)

Week 7: Examples of data fitting and analysis

Week 8: Sample preparation: concept of standards (primary and secondary), traditional methods of analysis (gravimetric, volumetric, potentiometric methods)

Week 9: Analytical separations (solvent extraction, chemical precipitation, chromatography, types of chromatography – size exclusion, ion exchange, affinity, gas, high pressure liquid chromatography, field-flow fractionation)

Week 10: Theoretical basis of chromatography (concept of plates, theoretical plate height, plate count, resolution, retention time, retention factor, selectivity factor)

Week 11: Differences between rate theory and plate theory

Week 12: Protocols with video demonstration of separation techniques