

## YSC2246: Experimental Methods in Physical Sciences

Mondays and Thursdays 14:30 – 15:50 in Classroom 20, Wednesdays 13:00 – 16:00 in Science Centre

**Prerequisites:** YSC1207 General Chemistry or YSC1213 General Physics

**Textbooks:** Quantitative Chemical Analysis, 9<sup>th</sup> edition by Daniel C. Harris, ISBN: 978-1464135385  
Measurements and their Uncertainties by Hughes and Hase, ISBN: 978-0199566334

**Instructor:** Stanislav Presolski, Cendana 02-05E <https://youtu.be/5Qp8e1CxvM>

**Office Hours:** Open door policy, i.e. if I am in - you're welcome, if not - wait for 5 minutes, and if I don't show up, I'm probably in the lab or in a meeting, so drop by some other time or make an appointment.

**CAP-consistent grading scheme:** <- A+ >96%, A >92%, A- >88%, B+ >84%, B >80%, B- >76%...

**Lab Blurbs:** 10% <- short summaries of experimental set-ups and/or data analysis and plotting

**Lab Reports:** 30% <- three comprehensive reports emulating scientific journal articles

**Mid-term Exam:** 30% <- a comprehensive in-class exam in Week 10

**Final Project:** 30% <- design, build, and use your own apparatus to make scientific measurements!

<https://www.yale-nus.edu.sg/newsroom/15-january-2019-learn-about-scientific-measurements-and-build-your-own-instrument/>

### Course description and Learning goals:

Learn the fundamental tools and techniques used for experimental research in physical sciences. By harnessing interactions between light and matter, we can probe the laws of nature and build the foundations for modern technology. This course will prepare you to join an active research group carrying out cutting-edge experimental research and will culminate in a final project. **On successful completion of the course a student should be able to:** explain basic statistical concepts like noise, bias, precision, and accuracy, calculate the uncertainty of a derived measurement, keep a thorough, organized lab notebook, design and implement laboratory experiments, plot complex experimental data and perform nonlinear fitting with statistical analysis, explain electromagnetic phenomena, calculate the path of light using geometric optics, interpret spectra from nuclear magnetic resonance (NMR) and other instruments.

### Lab safety:

Entrance to the Yale-NUS labs will only be granted to those who have completed the online safety training and wear appropriate clothing, which minimizes the risk of severe bodily harm if an accident happens. That includes closed-toe shoes, long pants or skirt leaving no skin exposed, and the provided lab coat. Safety goggles and protective gloves should also be worn as instructed.

### Health and Wellness:

While academic work is a very important aspect of your college education, your physical and mental health should always be a top priority. No assignment, lab report or exam preparation is worth you skipping a meal or going without sleep! If you find that the course is extremely challenging and you are failing to cope with the workload, talk to your instructor and your classmates for more effective study strategies, help with planning, or additional tutoring. And if you are experiencing undue stress or feel you might benefit from private counseling, please contact the Yale-NUS Health and Wellness Centre. You may also wish to reach out to Associate Dean within your residential College or the Centre for Teaching and Learning (CTL) for learning accommodations. For this and other kinds of support: <https://studentlife.yale-nus.edu.sg/wellness/>

**Academic integrity:**

The work that you present and submit must be your own! Details on proper citation and what constitutes "original work" will be discussed in class or provided for each assignment, with grading rubrics specifying the penalties for minor omissions/transgressions. Faculty, however, are obliged by the College to report any case of plagiarism to the Committee on Integrity and Discipline, which might take further disciplinary action. <http://library.yale-nus.edu.sg/plagiarism/> <https://studentlife.yale-nus.edu.sg/policies/academic-integrity/>

**Attendance:**

As per Yale-NUS regulations: 1. Students are expected to attend all classes. Students must request the permission of the faculty member to be absent from classes. 2. Students are generally entitled to miss one class meeting of a course for the purposes of required fieldwork for another course. Students must nevertheless still request and agree this absence with the faculty member teaching the course they will be absent from. 3. Permission to be absent from class for reason of extra-curricular activities is not automatic and is at the discretion of the faculty member. 4. Faculty members may permit a student to be absent for a reason other than fieldwork, but is entitled to apply grading penalties. Faculty members determine their own practices in this respect and these will be clearly stated on the course syllabus. 5. Faculty members may penalize students for unauthorized absence. 6. Penalties for both authorized and unauthorized absence will normally be on a sliding scale of severity.

**Late Assignment Policy:**

Assignments will be considered late if they miss the deadline without an AD note or Medical Certificate from a Doctor. Late assignments will be penalized 10% of the assignment per day late. Students should request an extension as soon as possible, if they anticipate a scheduling conflict.