Math 271, Fall 2021 Syllabus

Course Title: Math 271, Applied Mathematics for Chemists I

Instructor: Colin Roberts, robertsp@rams.colostate.edu

Time/Location: MTWF, 9:00-9:50 am, Engineering E106.

Office Hours: TBD.

Learning Assistant Help Hours: TBD.

Textbooks: These are **NOT** required. My notes will be sufficient!

- *The Chemistry Maths Book* - 2nd Edition, Erich Steiner
- *Mathematics for Physical Chemistry: Opening Doors* - D. A. McQuarrie

Talk to me for options in obtaining both of these texts for the lowest prices if you do wish to purchase them.

Content: Over the next year we will cover the mathematics necessary for upper-level chemistry courses, particularly physical chemistry. The fall semester will be roughly split into three main parts:

- *Ordinary Differential Equations (ODEs).* First and second order ODEs, applications, and complex variables.
- *Elements of Analysis.* Series, power and Taylor series, series solutions to ODEs, and n^{th} order approximation.
- *Finite Dimensional Linear Algebra and Groups.* Vectors, matrices, eigen-problem, geometry of 3-space, groups, matrix groups.

Grading: Letter grades will correspond to 10% windows: 90-100% is an A, 80-89% is a B, etc. The following items will contribute to your final grade. **Grading:** Letter grades will correspond to 10% windows: 90-100% is an A, 80-89% is a B, etc. The following items will contribute to your final grade.

- Homework (30%) - Homeworks will be given most weeks. Solutions will be graded on correctness and clarity of supporting work. For example, complete sentences are expected. Assignments will be turned in by the end of class *in person.* If there are extraneous circumstances, you may submit your homework as a scanned PDF file to Canvas.
- Homework Review (5%) - After submitting homework, you will have to read through my solutions and compare them to your own. On a discussion board in Canvas you will comment on at least one of your mistakes and at least one thing you learned from the solutions. If you have no mistakes, then you will comment two things you learned from the solutions.
- Discussions (5%) - Discussions will be given out weekly. The tasks will be to watch a video, read a short paper, or another type of short activity and then discuss this with your classmates via Canvas. You will be required to post at least one comment of your own and reply to at least one other student.
- Quizzes (25%) - Roughly 5 Proctored quizzes we will be given. These will typically be a few problems and are based on the recent homework assignments. We

will take a whole class period to work on and submit a quiz. Students will be able to earn up to 50% of the points they missed on any given quiz by doing corrections.

- Oral Exams (25%) - There will be three oral exams in this class. These exams will be given in a one-on-one in person (or virtual) environment and run approximately 15 minutes. Alongside me, each of you will discuss the content with me as well as work to solve problems. Problems will be given ahead of time and you may work with others to get solutions. Solutions will be submitted individually and discussed during a set time. *Please make sure that you will have a way to at least vocally communicate with me or we will need to consider an exception.*
- Project (10%) - The last week of class will consist of working on a short project about a special topic. For example, we will look at the Stern-Gerlach experiment and the linear algebra of spin systems. Your goal should be to find out how this can play a role in chemistry or your field of choice.

Academic Integrity: Don't cheat. Check out `http://tilt.colostate.edu/integrity` for more details. While many things in life operate on the "better to ask forgiveness than permission" principle, this is not one of them. When in doubt, ask me ahead of time.

Groupwork on homework, unless specified otherwise, is *not* considered cheating in this class, and is very strongly *encouraged*. However, you are expected to write up your solutions individually; word-for-word reproductions look fishy at best, so please make sure to write things in your own words.

SDC: Have a Resources for Disabled Students (RDS) situation? No problem; just let me know as soon as possible.

Homework:

- Homework must be scanned (or typed) as a single PDF file and submitted to Canvas under the proper assignment.
- No late homework will be accepted. Homework must be turned in prior to the specified time.

Schedule Conflicts: If you need to miss quizzes or exams for any scheduled reason, you must contact me ahead of time (two weeks) and we will make new arrangements.

Other Expectations: Treat your classmates and me with respect. Homework that is not written legibly will not be graded.

Leftovers: Extra stuff that didn't fit any of the categories above:

- As always, your health comes first. If you are feeling sick, take care of yourself first.
- As the instructor, I reserve the right to alter this syllabus at any time. I'll announce any such changes in class, in as timely a manner as possible.
- If you have any issues at all, please do not hesitate to contact me. Pretty much every problem can be resolved via communication.
- Technology is a double-edged sword in learning mathematics. You should attempt to use technology to enhance your understanding without using it as a crutch. Wolfram Alpha, Desmos, and Geogebra can all be very useful.

- Related to the above, patience is your biggest ally. You will get stumped from time to time. Resist the urge to immediately ask for help or to right away Google the answer. Instead, try different things; see what you can do with the tools given. Draw a picture. Attempt to do the most obvious, most straight-forward thing possible, and work from there. The process of exploring questions and actively struggling with them will be the most helpful aspect of the class.