

Methods of Applied Mathematics Winter Quarter Mathematical Modeling Projects

In winter quarter you will get a chance to work on an individual project on a topic of your choosing in applied mathematics. The purpose of this project is to give you a chance to explore mathematics as it relates to real world problems, to learn how to read the mathematics literature, to learn how to write a mathematics paper that adequately explains the topic you have studied and to practice presenting your work to the class.

Choice of Topic:

I would like you to choose a topic in applied mathematics. The mathematics should be at a comparable level to what we are covering this year. The application of mathematics can be in any field, such as physics, chemistry, biology, economics or political science. You are not expected to conduct original research, rather you should learn about how mathematics has been used to model problems in other fields. However, your idea should have scope for exploring some mathematical methods in detail. Your model should make use of both qualitative and analytical methods and should be able to explain the mathematics you learn. It is fine to make use of numerical methods also, but this should not be the focus of the analysis. I will place some books, which contain ideas that you might find useful, on closed reserve in the library. You should also make use of the journals, including JSTOR. I will post some ideas with links to suitable resources on the web page.

You should submit a one-page project proposal by the end of week 2 of winter quarter. This proposal should be typeset in LaTeX and contain a title and one or two paragraphs explaining the topic you wish to study and why it is interesting. You should briefly mention the type of mathematical model you will use and give references to books or journal articles you hope to use.

Project Presentations:

Project presentations will start on Monday of week eight. Please sign up by the end of week two. Your presentation should be thirty minutes long with an additional five or ten minutes for questions. In your presentation you should start with some background information about the problem you are modeling, carefully explain how the model is constructed, and then explain how the model is solved. Your objective is to teach the class some mathematics, so make sure you explain all terms clearly and check that your audience follows your explanations. You are encouraged to make use of visual aids to help explain your results.

Project Paper:

I would like you to submit a ten to fifteen paged double spaced paper by the end of the week nine. A rough draft is due by the end of week seven. Your paper should start with a general introduction giving motivation for the topic you are studying. You should carefully present the model, taking care to define all terms and symbols and explain the assumptions being made. You should clearly specify a research question you want to answer. The body of your paper should outline what mathematical methods you used to analyze the problem and what inferences you are able to make. Your concluding paragraph should answer your research question, state the limitations of your model and allude to possible generalizations or improvements that could be made to the model. Your paper should include a title and bibliography. Your paper must be typeset in LaTeX, and include graphs and equations where appropriate.