

Mathematical Modeling Project Guidelines
Math 183 - Fall, 2015

The modeling project should be fun, useful and educational. It will be a group effort, so some organizational and management skills will be required. These skills are necessary for success in our world, and therefore worth working on. Borrowing from the team management literature, I have articulated some norms for the projects as well as roles for the team members. I have assumed groups of four people.

Norms for Project Teams.

1. No one individual is as smart as the entire group.
2. Everyone has something to offer.
3. Everyone has a responsibility to help others in their group.
4. Everyone has a responsibility to understand the full project and to ask for help if they need it.

Roles for the Projects

Each individual will have 2 roles; one role to help foster the group dynamics and the other role to divvy up the responsibilities involved in completing the project.

I. Group Dynamic Roles:

- **Project Manager:** Makes sure that the group is organized and has a clear plan for completing the project. This includes scheduling meetings and having a plan for what needs to be done before the next meeting.
- **Task Manager:** Makes sure that everyone knows what they are expected to do before the next meeting and makes sure that they do it. This might involve calling or emailing each person between meetings to discuss what they have/havent done. If someone cant do the work that needs to be done, the task manager is responsible for calling another meeting if needed.
- **Facilitator:** Makes sure that every member of the group is participating and being listened to and heard. This might involve asking ques-

tions of a member that's been silent and stopping others when someone's comment is being overlooked.

- **Harmonizer:** Identifies discord in the group and brings these to the table for discussion among the group.

II. Project Roles: In each case, the person assuming that role is responsible for that aspect of the project. It doesn't mean that they will do all that part of the project by themselves; it means that they are responsible for dividing that work up among the members of the group and ensuring that it is done and recorded correctly.

- **Director of Research:** Is responsible for the literature searches. The Director of Research identifies what needs to be searched for in the literature, divides up the literature searches to be performed among the group members, and coordinates changes in the searches based on information gathered and changes in direction. They are also responsible for making sure that the citations in the project are complete and accurate.
- **Director of Computation:** Is responsible for the computer programs involved in the project. The Director of Computation is responsible for designing the code so that different people can write different parts of the code. The programmer is responsible for making sure that any code written by different people can be integrated.
- **Reporter:** Is responsible for the written report. This involves taking notes during the complete process in order to keep a record of what has been done. The reporter may also gather everyone's individual notes and puts them together. The reporter is also responsible for editing the final report and making sure that the various pieces (that should have been written by different people) fit well together.
- **Oral Presenter:** Is responsible for the oral presentation. Everyone will participate in the oral presentation but the oral presenter is responsible for making sure that the group prepares the oral presentation and that everyone knows what part they will take in the oral presentation. Here is a check list for your final project.

There are two parts to the project, and your grade will be based on *both* parts.

1. The oral presentation. This will happen on the last two days of class (order to be determined by lottery). You should plan your presentation to be 20 minutes long. I recommend that you prepare a beamer presentation (“beamer” is a LaTeX version of power point). This will save you time during your talk, and will make for a smoother, cooler look. You can also do live demos, interactive activities, whatever you want to make it interesting for the audience.
2. The written report, which is due on the last day of finals, May 13, **Seniors: May 5**. There is no length limit (either upper or lower). Rather, you should be sure that all of the elements in the list below are included. The written report needs to be typed up, preferably in LaTeX, but you may use whatever word-processing environment you like.

You should be sure to have these elements in your project report, both the oral presentation and the written submission. They don’t necessarily have to come in this order, but you may use this order as a guideline.

1. Title and your name and the date.
2. An introduction that motivates the problem. Why do you find it interesting? What are the main points that you will make?
3. Background: who has worked on this problem or model? What are your main sources or inspiration? If the problem comes from another field, give the necessary background for non-experts in the field. (You may assume that your audience consists of your peers in this class.)
4. A description of the problem or mathematical model. Be sure to explain what all of the variables and parameters mean.
5. Analysis of the model. This could include numerical analyses and/or other types of analysis. For example: what are the fixed points? What are the “trivial” cases? Have you looked for any bifurcations and, if so, what are they? If you are using concepts or techniques that we haven’t all seen, describe them here. This should be the meatiest part of your

presentation/write-up. Include here simulations and graphs, and be sure to explain any simulations (how you did them, etc.)

6. Interpret your analysis in terms of the original problem. What can you conclude? What were you unable to answer? What were the difficulties that you encountered?
7. If you had infinite time, how might you continue your research? What would you do next? If you feel that you have it “all wrapped up”, you could say so, and explain why there is nothing further to say. Are there other problems that might be illuminated by the questions (and answers) that you asked?
8. Bibliography. Be sure to cite all references in the text, including ideas for simulations. Use the mathematics tradition of citing references by their number in the bibliography.
9. Any acknowledgments that you want to include.

You will have some time in class to work together, but you should plan to spend a significant amount of time outside class working on the project.

Timeline and due dates:

March 23	Project Teams and Brief Descriptions Due
March 30	Project Outline Due
March 30 - April 1	Conferences with each group (30 minutes). Scheduled outside of class.
April 13	Midway progress reports due: one page summary of progress on the model development, implementation and analysis. List any obstacles you are facing.
April 20 - April 22	Conferences with each group (30 minutes). Scheduled outside of class.
May 2 and 4	Oral presentations: 20 minutes each + 5 minutes for questions.
May 5	Written papers due for seniors
May 13 (or before!)	Written papers due.