Rubric for E4301 Projects

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Project Rationale

The purpose of the 4301 project is to work through the entire process of modeling, computation, verification and evaluation that is required to solve quantitative problems in numerical PDE's, by working on a problem of *your* choice (with guidance from me). As a guide, this document will lay out a possible template that includes all of the components of the project I am looking for and some notion of what I am expecting. A major theme of this course is making intelligent choices of problems, formulations, techniques etc., so for each part of the project I want you to justify your choices (or if they turn out to have issues, which they often will, to discuss what went wrong and what you would choose next and why). The project outline is essentially this set of choices and their justification.

Project Outline

1. Choose your problem and justify its importance/interest etc
2. Choose a mathematical model (PDE preferably)
   (a) Discuss its formulation
   (b) Justify and explain any approximations made to make it more tractable
3. Choose and justify your Numerical methods including
   (a) Choice of discretization: e.g. Finite Difference, Finite Volume, Finite Element, something fancier?
   (b) Choice of Linear/Non-linear Solver

(c) Choice of software for modeling/visualization/analysis

4. Present results on your implementation, what worked, what didn't and why. If possible, results should include basic convergence and regression tests as well as any arguments to justify that your numerical model is doing what it's supposed to be doing.

5. Discuss pros/cons of choices (including whether you think the model is useful); what you might do differently next time; what the next steps might be if you continued the project.

Project Proposal

For your project proposal, what I am looking for (at this point) is one to two paragraphs discussing at least Points 1 and 2 above (i.e. what problem do you want to solve and how are you going to sort out a PDE model of the problem). If you have a sense of numerical methods you would like to try, that would also be very useful.

Overall I am quite flexible in the scope and direction of these projects and am happy to work with you to flesh them out. They can be parts of ongoing research, something you just always wanted to try, or a starter problem for new research. Pitch me an idea and we'll take it from there.

To hand in your proposal, just add it to your bitbucket repository under a directory called Project. Ideally I should see a `apma4301proposal_<userid>.tex` and it's corresponding pdf file. Word docs are acceptible, but now is a good time to start learning LaTeX (on top of everything else you need to know).