CEE5735/6736: HOMEWORK

PROJECT PROPOSAL

This course covers material on *clear box*, *black box*, and *grey box* models. In the first case we focus on mechanistic descriptions of the system at hand (*i.e.* expressed as ODE and PDE that may be solved exactly, or approximately using a computer), and in the second case we deal in data-driven models (*i.e.* expressed as statistical and/or machine learning models that occur in the form of a computer program.) The final case combines these two approaches to form a modeling framework with a partially formed mechanistic description.

Consider a physical system (naturally occurring or human made) that you are interested in. Identify an aspect of the system that you would like to model using mathematics. Please carefully describe the system of interest, the aspect of the response you wish to model, and the general approach you propose to adopt in your mathematical formulation: clear box, black box, or grey box. This modeling context will become the theme for your semester-long course project.

You may certainly propose using modeling techniques that we have not yet covered in the course (the syllabus outlines our techniques), but please provide a justification for any such approaches, and also some tentative details concerning your expected approach: answer "what", "how", and "why" questions about the techniques to be applied in your proposed mathematical modeling.

I am looking for a total of one or two page (maximum) description of the problem, statement regarding the mathematical modeling approach, and some pertinent mathematical details.