Design Your Own Project

Step I – Identify the Application

A variety of applications of differential equations have been discussed in this course. Newtonian mechanics, population dynamics, electrical circuits, and mixing problems have all been discussed. The diversity of these applications illustrates the broad applicability of differential equation. To add emphasis to this point, this project requires that you identify an application of differential equations in a subject area of particular interest to you.

You are specifically encouraged to discuss this project with a project mentor. The should be a professional scientist, *e.g.*, a professor for another course you are presently taking, a course you will be taking next semester, or your academic advisor. Explain this assignment to them (provide a copy of this project assignment).

The application should be solvable by techniques discussed in this course. The only other requirement is that the model have at least one parameter. The equations should be ordinary differential equations, but can be either initial value problems or boundary value problems. The equations can be of any (positive) order. The problem might involve a single equation or a system of equations.

Step II – Background Investigation

The main result of this assignment will be a brief description of your project, in the form of a project assignment. Prior to writing this assignment, it will be necessary for you to thoroughly understand the problem and the main questions that are to be addressed.

In consultation with your project mentor, you should identify a short list of references for your application. These references should be accessible to students in our class (including you), but do not need to be mathematical.

Study these references, paying special attention to the mathematical modeling used to convert the physical problem into a mathematical problem, any assumptions that are made during the modeling process, and the questions that will be the focus of the project description you will create. (Be sure to request assistance and clarifications from your mentor or me, as needed.)

Step III – Project Description

Prepare a project description for your project. This description, which can be no more than two pages — one page is more than enough in most cases —must be typed (word processed) and may include illustrations or other graphics as needed.

The project description should contain all of the following: title, your name, name of project mentor, brief description of the physical problem, summary of the mathematical modeling, questions to be answered in the analysis, realistic values for all parameters, and a list of at least two references related to the project.

Step IV – Summary and Conclusion

This project is longer than it sounds – unless you start early and divide the assignment

into manageable portions. Even though you may not have to answer the questions you pose for this project, your next step will be to answer the questions in one of the projects proposed by one of your group members. Thus, it is important that you select relevant, interesting, and tractable questions. This may take a few iterations before you find the appropriate level; do not be bashful about asking for help or discussing your ideas with me.

Each group member should describe their project to the group. The groups then needs to select one of the projects for further analysis. Be sure that all questions are answered, and that final report is similar in style to the other project reports prepared for this course.