

Algorithm for Solving Environmental Engineering Problems

1. Draw a picture, label the knowns and unknowns;
2. State any required assumptions;
3. Identify boundary and initial conditions;
4. Write the full governing equations;
5. Simplify the governing equations based on assumptions;
6. Solve the equation algebraically;
7. Apply initial conditions and boundary conditions to determine the constants of integration;
8. Substitute in numerical values if required and solve for the unknown numerical solution.

Homework Format

The following items are required for your homework assignments. However, you will find that these items constitute a rational approach toward completing any engineering problem. Following this procedure will help you better understand your solution rationale when you refer back to the problem at a later date.

1. Always start a new problem on a new sheet
2. Write legibly. Print if necessary. If what you have written can't be read, you may not get full credit, even if the answer is correct.
3. If appropriate, draw a picture or schematic and label its important components, both knowns and unknowns.
4. List initially defined variables at the top of the page, giving definitions, values and units. Variables defined later should be prominently placed and identified in the solution derivation.
5. **STATE ALL ASSUMPTIONS**, including initial and/or boundary conditions. Making and stating your assumptions for peer review is a critical engineering/communication skill.
6. Write the full governing equation that you are basing your solution upon, then simplify that equation based upon the assumptions you have made. Indicate what your limits of integration, etc. represent.

7. Annotate, comment, or explain calculations. Add brief comments every few steps about what you're doing. A long list of equations is hard to follow, especially if there are errors. Often it helps to write "word" equations to clarify your objective. This also helps when you need to refer to your work at a later date.
8. **ALWAYS USE UNITS.** Include units on all numerical values and make sure that they are all consistent with the desired units of the final answer. Keeping track of units helps to solve a problem by identifying deficiencies or inconsistencies in the variables used to describe a system.
- 9 Always express your governing equation(s) and appropriate boundary and initial conditions completely in variable form before you substitute numerical values. It is often easier to leave all quantities as variables during intermediate steps and substitute numbers only during the very last steps.
10. If appropriate, plot your results. Plots should be done via computer (hand-drawn plots are not acceptable). If a question asks you to express a variable as a function of time, provide both the algebraic equation and a plot of the variable over time.
11. If a question asks you to compare two or more values, provide a brief discussion of why they are the same or different (i.e., do not simply state that they are equal or one is less than the other). The explanation should be brief but substantial (i.e., 1/4 of a page or so - enough to demonstrate your understanding of the concept.)
12. Circle or otherwise clearly label final answers. If you consistently do not circle your answers, you may not get full credit, even if the answer is correct.