ENV 6002: Physical & Chemical Principles of Environmental Engineering

Fall 2021 University of South Florida
GROUP PROJECT Prof. J.A. Cunningham

This assignment is based on a similar assignment that was developed by Professor Qiong (Jane) Zhang during the semesters that she has taught ENV 6002. I thought Prof Zhang's assignment looked valuable for student learning so I decided to adopt it too.

Overview:
The group project involves choosing a system (natural or engineered) and a chemical of interest and modeling the fate and transport of the chemical of interest in the identified system. You are expected to cover key factors influencing the fate and transport of chemicals including relevant chemical properties, environmental characteristics, and physical/chemical processes (such as inter-phase mass transfer, advection, dispersion, and reaction).

The final presentation and report will contain the following elements:

- Chemical to be studied – why did you consider this chemical, what chemical properties are used in the model, and where do you find such data.
- System to be studied – why did you consider this system, what are the physical properties of the system used in the model, and where do you find such data.
- Assumptions and simplifications – describe all assumptions and simplifications made for the model development.
- Mechanisms – describe all mechanisms considered in the model.
- Mass balance – display relevant mass balance equations for the system and explain each item involved in the equation.
- Results – display the results in term of the concentration profiles or concentration histories of the chemical of interest.
- Model validation – depending on the chemical or system you selected, this might be qualitative or quantitative. You should evaluate how well the model can simulate the real system.
- Discussion – interpret the results and discuss the limitations of the study, including relevant uncertainties.
- References

Groups:
We will either have 3 groups of 4 students each, or 4 groups of 3 students each. More information will come soon regarding how groups will be formed.

Topic:
Each group can choose their own topic. Professor Zhang listed the following as possible examples of project topics.

- PCBs in the Great Lakes
- Mercury in a river (e.g., Little Wekiva River near Longwood, FL)
- Volatile Organic Compounds in indoor air
- Removal of trichloroethene (TCE) and tetrachloroethylene (PERC) from water using an engineered system (e.g., air stripper, activated carbon)
- Nutrient removal in wastewater treatment processes
- Nutrient uptake in an algae bioreactor

These are simply illustrative examples; there are no particular topics that are expected. It is ideal that you choose a topic that overlaps with your research or personal interests.

Deliverables:

- Topic statement – By November 2, inform me of your topic and your general plan for what processes you will account for in your model. (Details are not required at this stage.)
- Oral presentation – Each group will present its work to the class on one of the last two days of class (November 30 or December 2). Each group will probably have 15 minutes for the presentation and 5 minutes for question-and-answer. All students in the group are expected to contribute to the project, but you can choose how many group members will deliver the presentation – it can be shared among the whole group or delivered by a sub-set of the group, or even by a single individual, as your group decides.
- Project report – The final project report will be no more than 15 pages (single-spaced) with all figures, tables, and references. Your report should include the following sections: abstract, key words, introduction (chemical and system identification), model assumptions and mechanisms, model development (mass balance derivation), results and discussion (model validation and/or application), and references.

Distribution of credits:
Project Report 80%
    Abstract and key words 7%
    Introduction 10%
    Assumptions and mechanisms 10%
    Model development 25%
    Results and discussion 25%
    References 3%
Oral presentation 20%