

Spring 2021

Advanced Computational Physics 377

Final Project – Overview and Instructions

The Final Project accounts for 30% of your grade in the course

Important Dates

Monday, 12th April, 8:00 PM

Brief (max 1 page) Final Project Proposal Due

Tuesday Lecture

We will **not meet in-person** in the classroom (no new lectures or new material to cover). During the regular lecture time (2:00 – 3:15 PM), we will meet on zoom on April 13, April 20, April 27, and May 4. This zoom meeting is for students who would like to have additional discussions regarding the final project or need help with the Project or HW assignments. However, if there is general consensus based on student preference, we will continue to meet in-person in the lecture classroom and I can keep the zoom meeting open as well.

Tuesday and Thursday Labs

We will **continue to meet** in-person in the labs (5:00 – 6:55 PM). **Use** or **block** this time to work on the Final Project. Do not wait. Start working on the project.

Tuesday, 4th May, 11:00 PM

Final Project Submission Deadline

Submission should include:

Codes and data: All project-related files. It should include Python codes, project related input data and output data files.

Report: Project report uploaded to **myCourses** (as a single PDF file)

Project Topics

I encourage you to select your own topic for your project. The project can be either an extension of the computational techniques that we did in class this semester, or could involve computational techniques that we didn't talk about. Ideally, it will involve some combination of working on computational techniques and addressing an interesting physics problem. If you work in pair with another student, the project should be broader in scope and work should be equally divided.

I have discussed some project ideas in the **class lecture**. However, you have the freedom to pick any topic which may or may not include ideas from the lecture.

In either case (if you choose your own topic or one of the ones that I referred to), you need to submit a short project proposal (less than 1 typed page) explaining what you plan to do. Once you have my approval and feedback, you can proceed with your project. The proposal itself will not be graded. **The proposal is due on Monday, April 12th at 8:00 PM. I encourage you send it to me sooner. This way, I can provide timely feedback and you can get started sooner.**

Breakdown of tasks

To successfully complete your project, you will need to organize your work in following tasks:

Background research — Do basic research on the problem of interest. Define the problem and write your project report. You will at least need to get a grasp of the underlying physics and the broader context. Include any equations you need — showing derivations if appropriate. You could include a little history too. If you refer to textbooks and web resources, please cite them.

Program development — This can itself be broken up into several tasks. Define the problem, design your program, write the algorithm, write the code, and test and refine it.

Investigation and Analysis — Use your program to investigate the problem and analyze the data.

Write the report — Start as soon as possible. Do not leave all the writing until you have finished developing and running the program.

Working together

You are encouraged (some of you already do this during the labs), to discuss your work with other students. However, while exchanging ideas and comparing results is fine, your final program design must be your own and you must write all code yourself. Similarly, any results that you present must be obtained with your own program. **If you work in pair**, the project should be **broader in scope**. Also, there needs to be **equal division of work** and I will require a breakdown of **individual effort**. Each individual is responsible for submitting their own versions of the electronic files. If you end up getting extensive help or ideas from someone else, then you must acknowledge this in your project report.

Functions from Python and Python modules

You may use the standard set of elementary math functions but you may not use the built-in numerical methods functions (e.g., ODE solvers, integration routines etc.). In general, you should implement numerical methods that we have covered in the course yourself. If in doubt as to whether a particular function is allowed, check with me.

Project Programs

You must submit all Python .py files that you write for the project, including the main function, any sub-functions called by the main function and any stand-alone functions or scripts (e.g., for plotting graphs, initializing input data files *etc.*). Importantly, you should upload anything that would be needed in order to run your program(s) and reproduce the results.

Each separate .py file should start with a header comment, which should

- Give your name and the project title;
- Describe briefly the purpose of the function;
- List any input parameters and/or files;
- List the output values and/or files.