

Lab 3 – Project Management & Implementation

Timeline

- Lab 3A Report: Sunday, February 19th, 2023, 11:59PM
- Lab 3 Design Presentation: Friday, February 24th, 2023, 3:00PM
- Lab 3B Report: Friday, February 24th, 2023, 11:59PM

Lab 3 (Parts A and B) is scored over a total of 200 points. The breakdown of the points is the following:

- Lab 3A Report: 100 points (5% of total grade)
- Lab 3 Presentation: 30 points (1.5% of total grade)
- Lab 3B Report & Code: 70 points (3.5% of total grade)

Submission Instructions

Students are expected to work in their assigned lab groups. Lab 3 is to be completed over the next two-week period. The lab consists of two parts. In Part A, the group will do project planning and create a report documenting the plan. In Part B, the group will implement the project plan and deliver a presentation to a TA. The groups should consider preparation time for the midterm when planning their work on Labs 3A and 3B. Note that you are allowed to start working on Lab 3B earlier if you have already submitted Lab 3A, as long as this decision is reflected in your plan. Lab reports and code must be submitted via myCourses.

Lab 3A report is due Sunday, February 19th, 2023. Project plans described in Part A must reflect the planned time of writing the report, as it will affect the amount of time available to you to work on Part B.

Lab 3B report is due Friday, February 24th, 2023.

The Lab 3 design presentation must be completed by Friday, February 24th, 2023. Keep in mind the availability of TAs in the lab; you can only present your work if a TA is present. Instructions on the presentation can be found in this [handout](#).

Objectives

By now you should have finished Lab 2 and have a rough estimate of how long it takes each of you to create a prototype of your mini-project, and an appreciation for the tasks that remain. The objectives of Lab 3 are to give you a hands-on practice in planning and managing a technical team project to its completion. This will help you better prepared to work in a larger team on a more complex task such as the final design project.

Resources

You will need your lab group's DPM kits, as well as any other readily available household items (e.g., cardboard boxes, scotch tape) accessible to you that are necessary to implement the system you've designed. You will also need the new/updated design idea your team has selected at the end of Lab 2. You will also need to create a Gantt chart for your group. Making a Gantt chart will help your team keep track of your progress while working on the lab.

You can download the GanttProject software from this link: <https://www.ganttproject.biz/>

Requirements

As mentioned in the Lab 1 handout, your marching band should include the following:

- 1) A digital flute that does not require to be blown into to play **at least four different musical notes**.
- 2) A physical drumming mechanism that plays a distinct rhythm that compliments the digital flute.
- 3) An emergency STOP mechanism to halt the marching band in any given situation.

The software implementation of the instrument must be done in Python 3.9 or higher. You should respect the project structure proposed in the starter code, but you are allowed to add helper classes and functions as you wish.

Part A: Project Management

Lab 3A Report (100 points)

Section 1: Project timeline (45 points)

Provide a Gantt chart for the mini-project implementation. Note that the start date must be the day on which you start working on Lab 3B. Your Gantt chart **must include**:

- Project milestones
- Critical path(s)
- Tasks
- Dependencies between tasks.

Note that all tasks need a start date and an estimated end date.

The Gantt chart must be completed using the Gantt project software tool. If you wish to use a different tool, you must obtain permission from a TA.

Section 2: Budget (30 points)

Each member of the team should put 6 hours toward the lab per week. That is, you have 12 hours per person to complete both Part A and Part B of the lab.

You will need to plan the number of hours you spend on each task mentioned in the Gantt chart. Moreover, *you need to keep track of the hours spent on Lab 3A for each team member*, since those should be deducted from the available time to work on Lab 3B.

Considering this, and the tasks presented in the Gantt chart, provide a budget for Part B of your project. The budget should be a table outlining the different tasks presented in the Gantt chart along with their time estimate. Make sure to indicate the total number of hours in the table.

Note that the 12 hours/person cannot be distributed any other way among the team members. That is, budgeting to have 2 members work 18 hours each is not allowed.

Example: Team 100 is working on Lab 3 together. All six members of the team meet for two hours to work on Lab 3A. That means, each member has 10 hours they can spend on completing Lab B. They must estimate the time that should be spent on each task such that the total is 60 hours and can be divided evenly among the team members.

Section 3: Roles and responsibilities (20 points)

Each task presented in the budget should be assigned to a team member. That team member will be responsible for making sure the task is completed. Keep in mind that some tasks are estimated to take longer than others, hence you need to make sure that the workload is balanced.

Moreover, provide a plan for how your team will keep each member of the team accountable to completing the tasks, so that they get done on time.

Section 4: Meeting minutes (5 points)

Provide minutes of all the meetings you have as a team. Some teams will have more meetings than others. Therefore, the number of minutes submitted will vary between teams.

Part B: Implementation and Testing

Following the project management plan you've created in Part A, implement your selected system. Keep track of the amount of time each member spends on each task. This will help create estimates for budgeting your final design project.

Code Submission (5 points)

You should submit the entire source code folder in a .zip file on myCourses. You will be evaluated on code functionality, style, and documentation.

Lab 3B Design Report (65 points)

Provide a report documenting the iterative evolution of your system design. Describe your final system, its components and their iterative design evolutions, and related tests conducted at each stage of the design process. Provide a description of the hardware and software components.

At the end of reading your Lab 3B report, the reader should know: a) how your final system works, b) how to recreate the hardware and software components of the system themselves, and c) what alternative design options to avoid (because you've tried them already, and they did not work). Sections 1 to 3 below provide suggested headings/structure of the design report. At the end of your report, you must have a Conclusion section listed as Section 4 below.

Section 1: System Design (25 points)

Present your final system and its components. Briefly explain how the system works. List the inputs and outputs of your final system. Describe the iterative design evolution of your system. Provide pictures, sketches and/or flowcharts of your final system design and of your system's design iterations. Provide pictures of the final design from all angles.

Section 2: Subsystem Design (10 points)

A subsystem can be defined as a group of components that perform a specific task or have a specific role in the system. Examples of subsystems for this lab could be:

- A "note-selection" subsystem: an algorithm that decides what note to play based on input data
- Hardware subsystem: Your hardware components
- Software subsystem: Your software components
- Sound subsystem: The speaker, along with any other component that produces sound.
- Etc.

You can divide your system into subsystems in any way that you think is relevant for this lab.

Describe the subsystems of your design (at least 2 subsystems). For each subsystem, describe the purpose (i.e. the role it plays in the final system) of the subsystem. If a subsystem has many components (e.g., several sensors or several classes), explain how the components interact with each other. List the inputs and outputs of each subsystem. Provide pictures, sketches and/or flowcharts of each subsystem design and of each subsystem's design iterations. There must be at least 1 visual per subsystem.

Section 3: Validation and Testing (15 points)

Provide all tests (other than those reported in Lab 2) conducted throughout the design process, including integration tests. Include any graphs or tables reporting test results. *Explain how your test results guided the iterative design process of your final system or subsystems.* Do not copy your Lab 2 contents into this section.

Full test procedures are not required for this section, but each test should have the following information:

- Date
- Goal
- Subsystem(s) involved
- Tester(s)
- Test Procedure
- Test data (in table form)
- Test conclusions

Section 4: Conclusions (15 points)

- Reflect on the final performance of your system. Does it meet the client's needs, and requirements and specifications you've outlined in Lab 1? Make references to the evidence of the successes and failures (e.g., test results).
- Reflect on your project plans and management. Referring to your team's Lab 3A report, identify where your team's work deviated from your initial plans (if any). Did you do more tests, did some tasks not get done? Did you change the order of some of the tasks?
- Provide a summary of the time spent each of the project tasks you have completed. Reflecting on the project budget you've started with (Lab 3A), describe whether your team's project was completed over or under budget. Also, reflect on which types of tasks were done under or over budget.
- Reflect on your group's division of labor. How well did the team work together as a team? Think of team dynamics, hours spent per task etc.
- Outline lessons learned from this project in preparation for the final design project. What went well for your team? What will you keep doing for the final design project? What didn't go so well, and how will you do things differently as individuals and as a team?

Lab 3B Mini Project Presentation to the TA (30 points)

You will present your team's fully working system to a TA during your lab hours.

Throughout the presentation, your TA will ask you questions about your system and request a demonstration of it. The TA will ask you about design iterations, testing and group work. All members of the team will be expected to speak.

1. Demonstrate your fully working marching band by playing 4 distinct notes on the digital flute and a distinct rhythm made by the mechanical drum at the same time. Demonstrate how the emergency stop mechanism works (10 points).
2. Present your final system design and compare it to your initial system design. Explain what changes were made to your initial design. Make sure to have your Lab 1 submission open to allow your team and your TA to refer to it. (5 points)
3. Describe what tests were conducted throughout the project and explain how the results of these tests impacted the design decisions you made. (5 points)
4. Describe any technical or interpersonal challenges you faced during this project and how you solved them. (5 points)
5. Answer questions related to your own system design. You should be prepared to talk about the design and implementation of any of your system's components. (5 points)

Important: You **do not need** to prepare any presentation materials (e.g. PowerPoint presentation) for the Lab 3 Presentation.