TEAM 12 Project Plan Assignment

Connor Larson, Kyle Riggs, Brandon Stark, Lucas Heimer, & Nathan Armstrong

2. Project Plan

2.1 Project Management/Tracking Procedures

a. Project Management

The project management style we are adopting for our design is waterfall. Due to the technical nature of our project we require a well thought out process and series of steps which will allow for the best progression of our project. In order to fulfill the necessary requirements for DNA synthesis, we need to first have a method of controlling where and how the DNA oligomers bond on the microarray. Then we need to create a process which allows for the flow of DNA molecules into the system to complete the DNA synthesis. Since these steps are complex and dependent upon previous steps, we need to create deadlines to be completed in sequential order.

b. Tracking Procedures

To keep track of our progress we will use a few mediums. First, we communicate as a group with our advisor through Slack. As well, we use Google Drive to take weekly meeting notes. This helps us keep track of our weekly discussions in regards to things we should try and work on for the given week. It also helps us store knowledge we gather from our advisor. In the future, once we get to the point of coding a User Interface for our project we will add in the use of Git. This will serve to show the progression of our code.
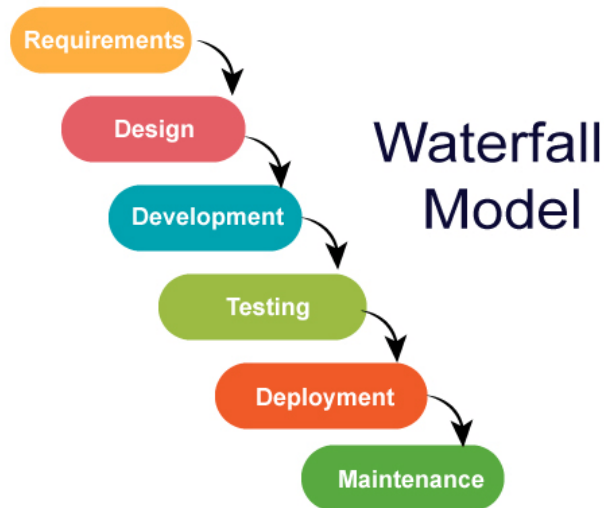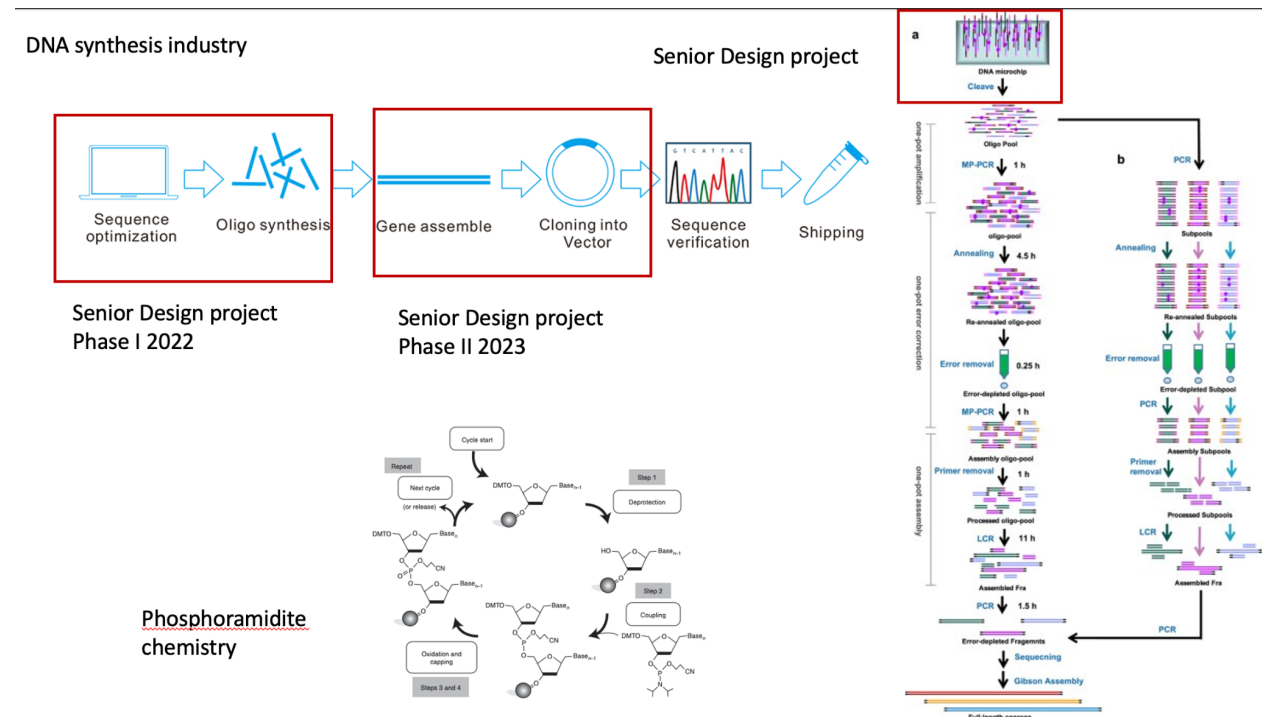
2.2 Task Decomposition

Tasks:

- Connecting to the LCD
- Developing the microfluidic system
- Coding a GUI

Subtasks:

- Understanding biology behind DNA synthesis
- Creating/coding a microarray to be displayed on the LCD
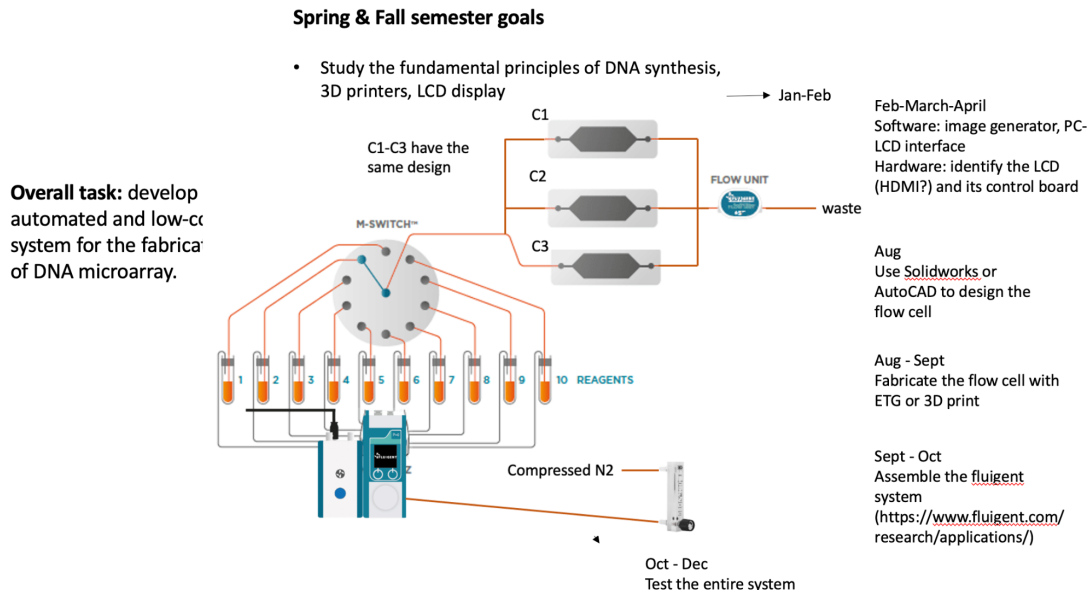- Communicate with LCD screen via created code

2.3 Project Proposed Milestones, Metrics, and Evaluation Criteria

Milestone	Measure Progress
Connect to the LCD	Proper, stable connection and ability to display/mirror our display to the desired LCD.
Develop Microfluidic System	DNA synthesis is completed according to provided code with accuracy of 85%
Coding a microarray	DNA is accurately sequenced based on input from GUI
Coding a GUI	Proper coding connection to display and ability to project image to desired LCD.
Communicate with LCD via created code	When the GUI application is ran, the desired images are displayed on the LCD.

2.4 Project Timeline/Schedule

Spring Semester	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
Understand biology behind DNA synthesis	██	██											
Research DNA Materials		██	██	██									
Dismantle 3D Printer to Interact with LCD				██									
Research LCD					██	██	██						
Connect to LCD							██	██	██				
Create GUI for LCD Screen									██	██	██	██	
Testing GUI										██	██	██	██

1. Understanding biology behind DNA synthesis (2 weeks)
2. Research DNA Materials (2 weeks)
3. Dismantle 3D Printer to Interact with LCD (1 week)
4. Research LCD (3 weeks)
5. Connect to LCD (3-4 weeks)
6. Create GUI for LCD Screen (3-4 weeks)
7. Testing GUI (3-4 weeks)

Spring & Fall semester goals

• Study the fundamental principles of DNA synthesis, 3D printers, LCD display

Jan-Feb

C1

C1-C3 have the same design

C2

FLOW UNIT

Overall task: develop automated and low-c
system for the fabrica
of DNA microarray.

M-SWITCH™

C3

waste

1 2 3 4 5 6 7 8 9 10 REAGENTS

Compressed N2

Feb-March-April
Software: image generator, PC-LCD interface
Hardware: identify the LCD (HDMI?) and its control board

Aug
Use Solidworks or AutoCAD to design the flow cell

Aug - Sept
Fabricate the flow cell with ETG or 3D print

Sept - Oct
Assemble the fluigent system (https://www.fluigent.com/research/applications/)

Oct - Dec
Test the entire system

2.5 Risks And Risk Management/Mitigation

Task:	Risk:	Risk Factor (1-10): 1 = Low, 10 = High	Resolution or Explanation:
Displaying to the LCD	LCD does not display what is intended	2	Replace LCD, or use a different way to connect to the LCD
Developing microfluidic system	Trying to understand the biology behind this task and implement it	7	Further understand task and get access to required
Modifying 3D printer	Breaking printer component	3	Component would be easy to fix or reorder
Coding GUI	Code does not work	4	Debugging
Communicating with LCD screen	GUI and LCD screen are not compatible and do not communicate	8	Change how we communicate with the LCD or use a different process behind the GUI

2.6 Personnel Effort Requirements

Task	Hours
Biology/DNA Research	20
Connect/Research LCD	15
Creating Microarray	10
Coding GUI	20
Communication between LCD and Created Code	10
Developing Microfluidic System	30
TOTAL	105

2.7 Other Resource Requirements

- HDMI to DIPI adapter for connection between computer and LCD
- Fabrication technology for flow cell
- Various chemicals for surface functionalization of flow cell
- DNA oligomers to be used in microfluidic system