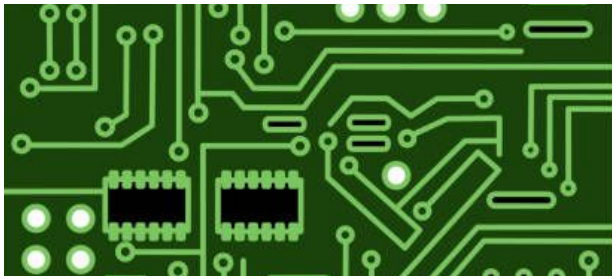
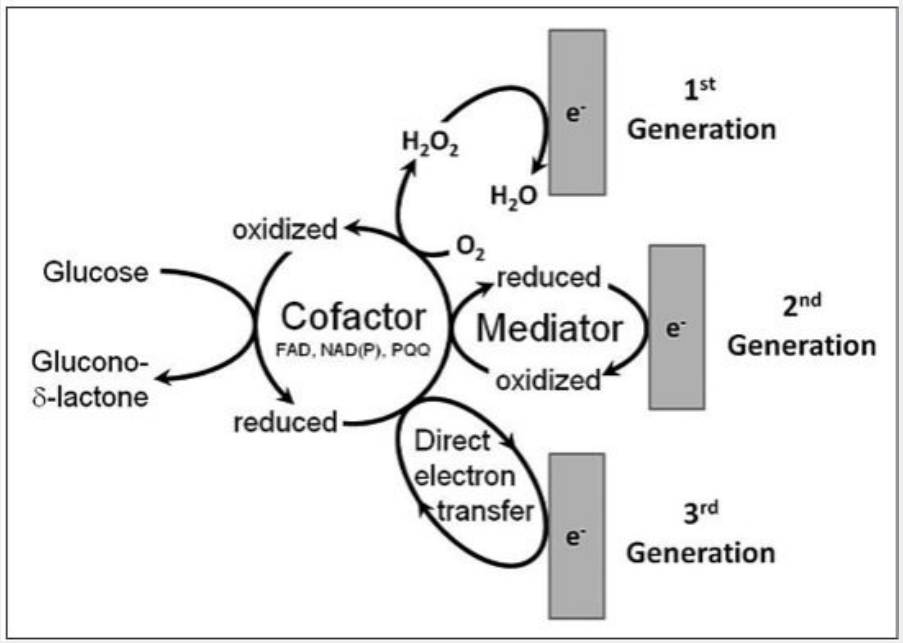


SweeTech

Glucometer Development Plan

Kayla Powell, Paulina Bargallo, Theertha Vannemreddy

How do glucometers work?



- Electrochemical reactions occur on biosensor
- Glucose oxidase (GOx) is most common enzyme
- Primary reaction is aerobic oxidation of glucose with GOx/FAD
  - O_2 electron acceptor
  - Concentration determined via O_2 consumption or H_2O_2 generation
  - Challenges: O_2 mass transfer limitations and high overpotentials
- Redox-mediated electron transfer introduced to improve efficiency, accuracy
- Advancements in nanotechnology allow for direct electron transfer to support continuous glucose level monitoring

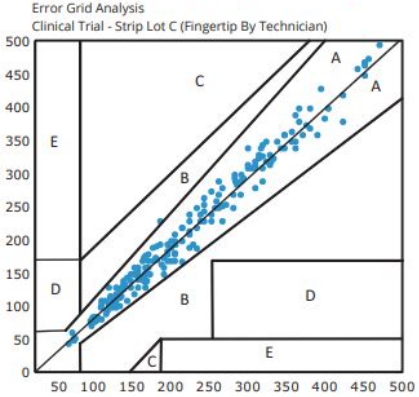
AimStrip® Plus Glucose Meter and Strips

- Reliable, Accurate Results in 10 Seconds
- Only 1μL Blood Sample Required from Fingertip or Forearm Testing
- Single Code Chip for the Life of the Meter
- Memory Allows up to 300 Records with Date and Time
- English & Español Instructions

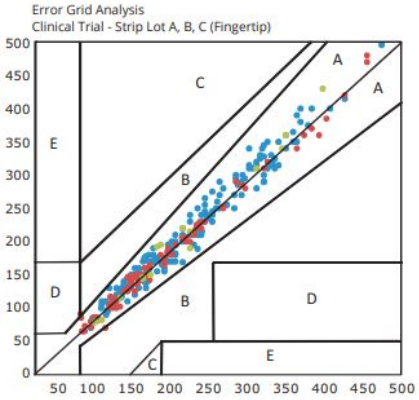
The AimStrip® Plus Blood Glucose Test Strips is stored in a sealed vial with desiccant. Each test strip contains the following chemicals:

Glucose Oxidase	**CAS Number:** 9001-37-0	**Concentration:** < 25IU
Mediator	**CAS Number:** 13746-66-2	**Concentration:** < 30μg

Accurate Fingertip Testing



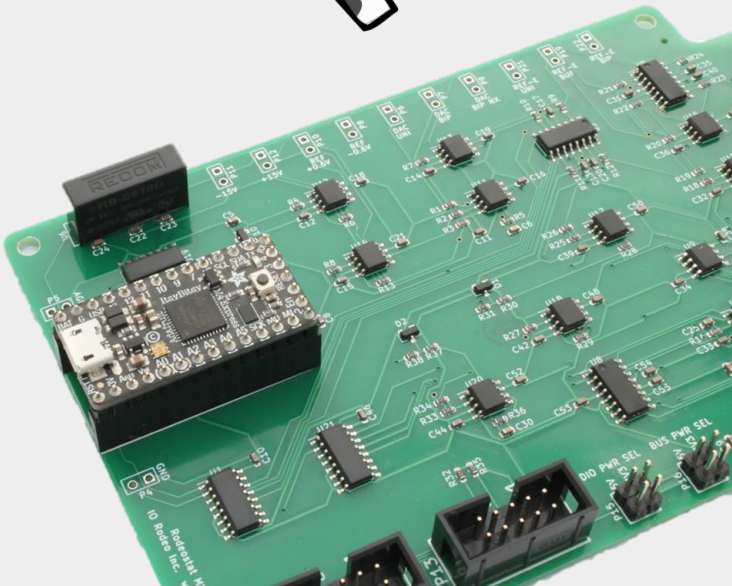
Patients can Perform a test as well as a trained technician



https://www.germainelabs.com/wp-content/uploads/2020/08/AimStrip-Plus-BG-Flyer-02-19.pdf

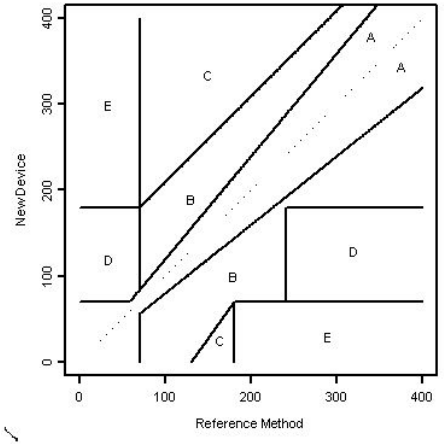
Our glucometer design

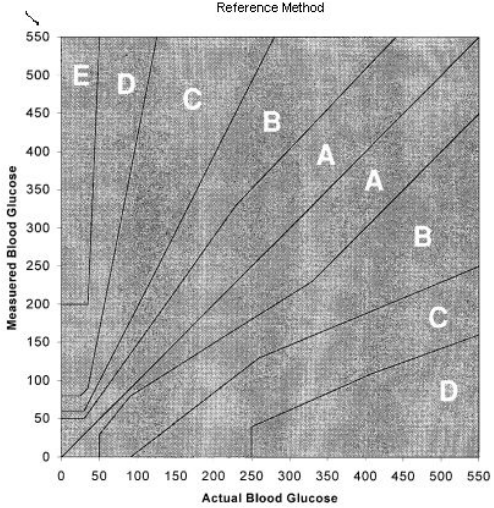
- **IO Rodeostat supported amperometry**
  - Digitally-controlled
  - Selective oxidation of mediator for calibration
- **Hardware selection**
  - Adafruit ItsyBitsy M4 MCU
    - Internal and serial flash memory
    - Supports python + USB debugging
    - 12-bit ADC and general in/output pins
  - Arduino GIGA Display Shield/R1 WiFi
    - High resolution and touch-screen function
    - SPI communication with board
    - Python support for integration
- **3D printing**
  - Biosensor connection
  - Sturdy design for practical use and secure integration of components



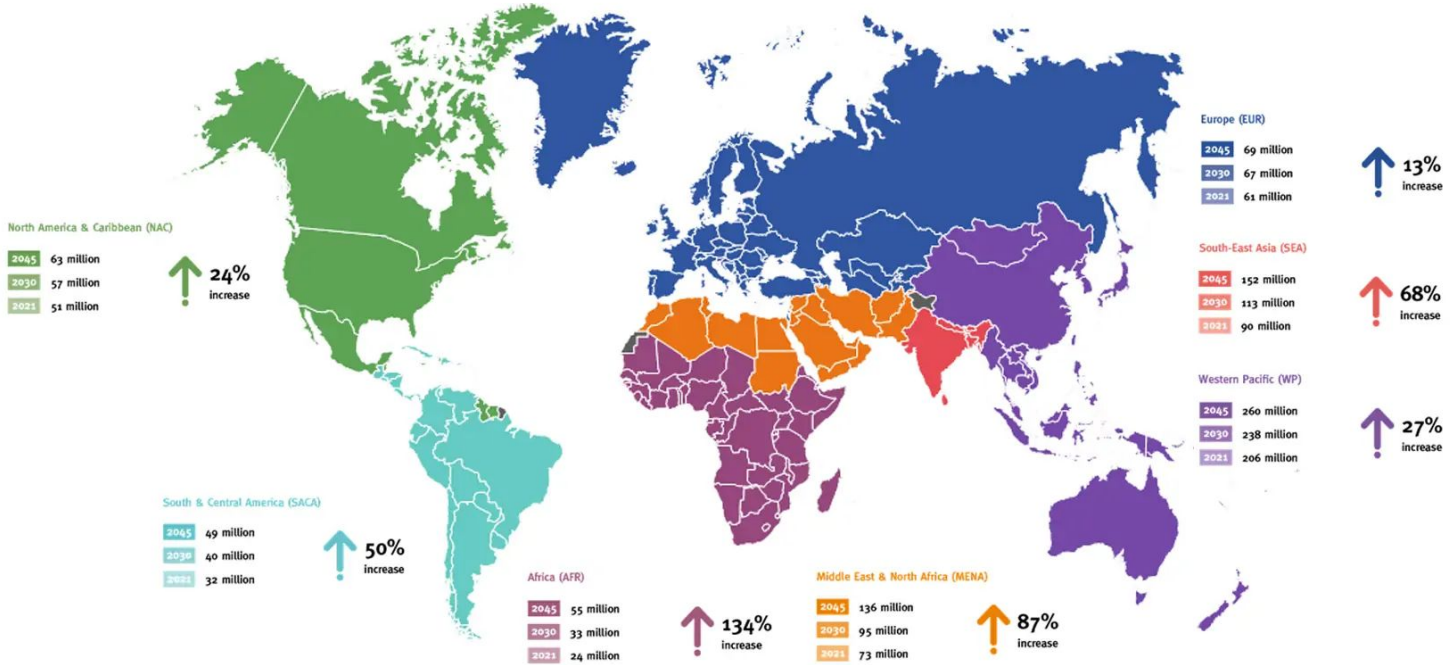
Accuracy standards

- **ISO 15197:2013** (user performance evaluation for 95% of samples)
  - <100 mg/dL: ± 15 mg/dL
  - ≥100 mg/dL: ± 15% error
- **Error grids (right)**
  - Clarke Error Grid (top)
  - Consensus Error Grid for Type II diabetes (bottom)
    - Advanced grid following the development of glucose monitoring devices
- **FDA/EU requirements**
- **WHO recommendations**
  - Testing range of 30-400 mg/dL
  - ISO compliance
  - 99% results fall within zones A/B of Consensus Error Grid
  - Technical and performance specifications are detailed for enzymatic with amperometric detection formats

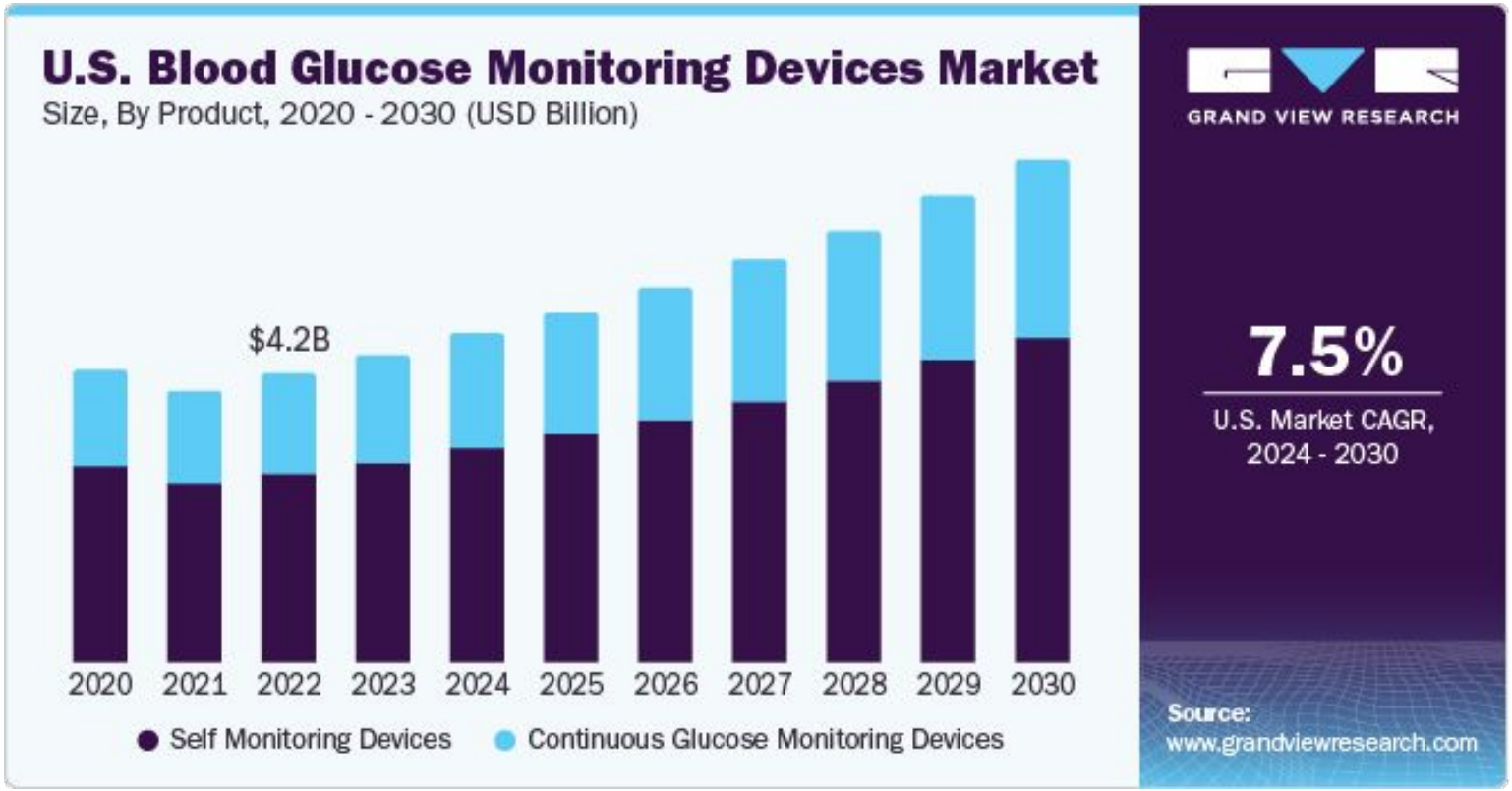




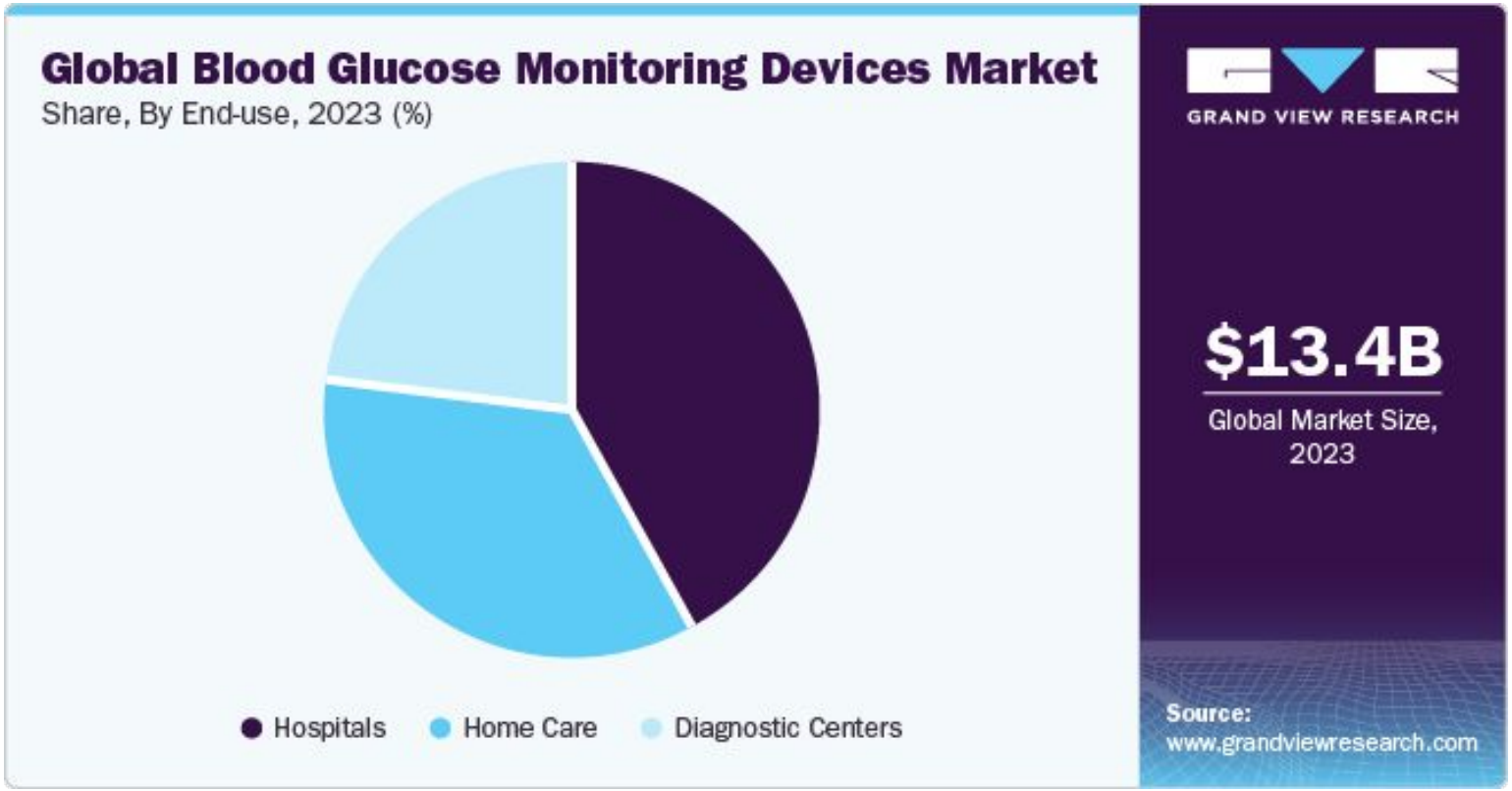
Diabetes and glucose monitoring market trends



Diabetes and glucose monitoring market trends



Diabetes and glucose monitoring market trends

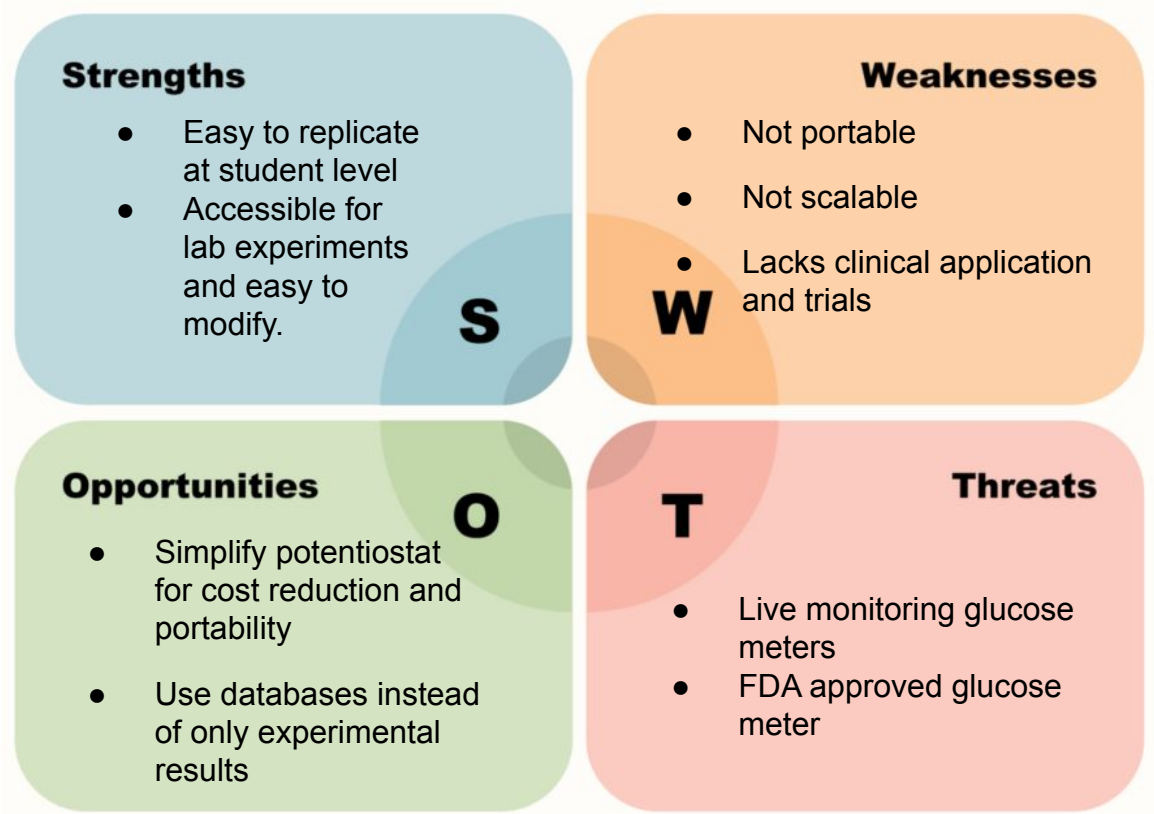


Competitive evaluation

- **Key features of industry self-monitoring devices**
  - $20-100 per glucometer
  - Portable, durable, compact
  - Most of cost is test strip (glucometers often included for free)

- **Features of SweeTech glucometer**
  - $240 potentiostat
  - $137 display components
  - Much more sophisticated potentiostat than is needed for glucometer function
  - Large and delicate potentiostat circuit (not portable/durable/compact)

SWOT analysis



Project timeline and deliverables

TASK NAME	STATUS	ASSIGNED TO	START DATE	END DATE	DURATION in days	Need to submit:	COMMENTS	Schedule
Planning	In Progress	All	01/27	1/31	5	For presentation and in february		internal schedule
Introducing Theertha to the Project	Complete	Kayla, Paulina	01/27	01/27	1		Show what we did last semester to Threetha so she knows our base line	
3-D printing	Complete	All	01/27	01/30	4	group assignment, (print one item per group), individually CAD files and		
3-D CAD files test	Complete	All	01/27	01/30	4	Have files ready by lab meeting on Thursday	CAD and slicing done for nameplates, box with sliding lid and UNO Case.	class schedule
3-D printing (test)	Complete	All	01/27	02/06	11	Have files ready by lab meeting on Thursday		class schedule
Writing	Complete	All	02/03	02/07	5	Compling Preliminary Design Presentation on team GitHub page		class schedule
Electrochemistry reactions and analytical methods	Complete	Kayla	02/03	02/07	5			class schedule
Firmware development	Complete	Kayla	02/03	02/07	5			
Product standards research	Complete	Kayla	02/03	02/07	5			
Project scope: Minimum and maximum expectations	Complete	All	02/03	02/07	5			class schedule
Materials; costing and sourcing	Complete	Paulina	02/03	02/07	5			class schedule
Getting proposal into github	Complete	Paulina	02/03	02/07	5			
Design principles outlined	Complete	Theertha	02/03	02/07	5			class schedule
Market research	Complete	All	02/03	02/07	5			class schedule
Proposal editing	Complete	Kayla, Paulina	02/10	02/14	5			class schedule
Getting updated proposal into GitHub	Complete	Paulina	02/10	02/14	5			class schedule
Sending materials to Joe/Dr Huff	Complete	Paulina	02/11	02/14	4			class schedule
Testing rodeostat with Fe CV	Not Started	Kayla	02/20	03/07	16			class schedule
Circuit design research	Not Started	Theertha, Paulina	02/20	03/07	16			class schedule
Set up of display	In Progress	Paulina	02/20	03/06	15			
Assignment 2: Update Presentation	In Progress	All	02/23	02/27	5	Updating project presentation as requested by Professor Osuji		class schedule
SPRING BREAK	Not Started	All	03/11	03/17	7			class schedule