Sweet Dreams
sd22p34
Dr. hasler

ECE4872 Senior Design Project

Nemi, the Stun Gun Self Defense Glove

Radha Changela	EE	rchangela3@gatech.edu
Hubert Elly	EE	helly3@gatech.edu
Elizabeth Herrejon	EE	eherrejon3@gatech.edu
Lara Kassabian	EE	lkassabian6@gatech.edu
Katie Roberts	EE	kroberts73@gatech.edu
Christine Saw	EE	csaw3@gatech.edu
Katie Weatherwax	EE	kweatherwax3@gatech.edu

Submitted
2022 May 3

Contents

Executive Summary

The world is a dangerous place, especially for women, as one in five women are sexually assaulted during their time at college [1]. This is a major problem that Sweet Dreams has decided to find a solution to. Sweet Dreams' Self Defense Glove, Nemi, is modeled after fingerless gloves with added features such as a stun gun to protect the user while looking fashionable and unassuming. The main goal of this product was to protect the user from a variety of dangerous situations. With that goal in mind, Sweet Dream strived to find a solution that no one would suspect to be a weapon, would be hard for the user to lose, and be effective in defense and offense. In the end, it was agreed upon to create an accessory woman would all wear. The arm component of the glove (as the glove dimensions reach from the middle of the fingers to the elbow of the arm) contained most of the electronic components, such as the battery and Bluetooth. All of these were assembled using integrated circuits on a flexible breadboard around the arm. On top of the hand contained the stun gun circuitry which was connected to metal electrodes on top of the glove so when the user punched an attacker, it would trigger the stun gun circuit in the glove, which would send the charge through the cable out the electrodes and shock the attacker on contact. The design would cost $47 to produce. The design worked such that when the user felt unsafe, she could press a button on the side of the glove, which would charge the stun gun circuit and notify her five prechosen contacts that she felt unsafe. Then when she punched an attacker, this would cause the stun gun circuit to discharge, shocking the attacker and notifying the police. The design would stand apart from competitors as it combined many offensive and defensive features. The product is set to be sold for $100, but the lives it will save will be priceless.

1 Introduction

Team Sweet Dream is requesting $300,000 amount of funding to develop Nemi, the self-defense glove. Today, it is normal for women to be hyperaware of their surroundings as they navigate unpresuming lives. It has also become customary for women to buy pepper spray, pocketknife, brass knuckles, and more to keep themselves safe. However, all these products are hard to use, clanky and evident to the attacker, and are often not allowed into public events, a place where tools like this would be important. Our product was designed to shock the attacker while being discrete and stylish for the user. In addition to shocking the attacker, our product also had a connecting app that would notify the users' emergency contacts once the device was discharged with the users' location. Sweet Dreams prioritizes safety for all with Nemi, our reliable, self-defense glove created to last. Many challenges were encountered in the development of our prototype and could be seen within the final design. State laws within the US differed for legally possessing a Taser or stun gun. Tasers are not easily accessible as they are primarily used in law enforcement and some states required a permit, therefore our design was for a stun gun with fixed electrodes. The following standards regulated the max voltage and current discharge allowed by our device and the testing method to ensure safety of the user and to prevent permanent damage on the attacker: UL 69, IEC 60479-1 2, IEC 60065, IEEE P360. To make our product discreet, the overall design faced limitations. All components used in the device needed to be small, the transformer needed in the stun gun circuit was our biggest issue. We used flexible breadboards to ensure the individual components sat comfortably on the glove. The primary desired solution was the one described above with a glove acting as a stun gun. The operating environment for the product's uses would be in an area of uncertainty, where the user felt unsafe. The successful completion of this design was demonstrated by a successful current discharge from the glove's metal decorations/charged electrodes after meeting all the right conditions/triggers. This was measured by having a multimeter measure the current discharge. The glove would also allow the user to send their current location to select emergency contacts via a smartphone app connected to the glove. The following report states in more detail the design specifications, concepts, testing methods, and codes and standards used to produce our final prototype.

2 Project Description, Customer Requirements, and Goals

Through the production of our product, there were a couple stakeholders we worked closely with and kept in consideration. Our faculty advisor, Dr. Jennifer Hasler, was our most influential stakeholder. We were fortunate to have Dr. Hasler as our advisor as our product lined up with her research interest in miniaturization and integration of electrical devices. As our advisor, she was kept up to date on a weekly basis and offered advice throughout the way. Our team reached out to female peers for their thoughts and advice of Nemi, as they are the target customers. Our team produced one prototype to demonstrate the functionality which was used in our final Capstone Design Expo presentation.

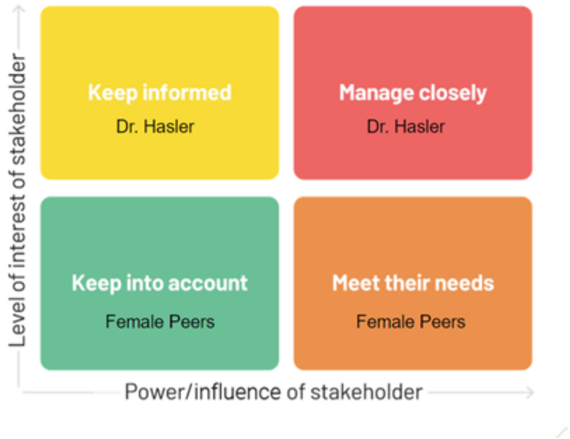


Figure 1: Stakeholder Chart.

The user would monitor their GPS location in an accompanying app that can hold emergency contacts to contact in case of discharge of the weapon. Customer requirements that the product has:

- concealable
- GPS tracking
- long battery life
- low cost
- comfortable while aesthetically pleasing
- durable
- user friendly
- shocks the perpetrator

All the requirements for the customers aligned with the hopes of the company and steps were taken to ensure that all the requirements were met.

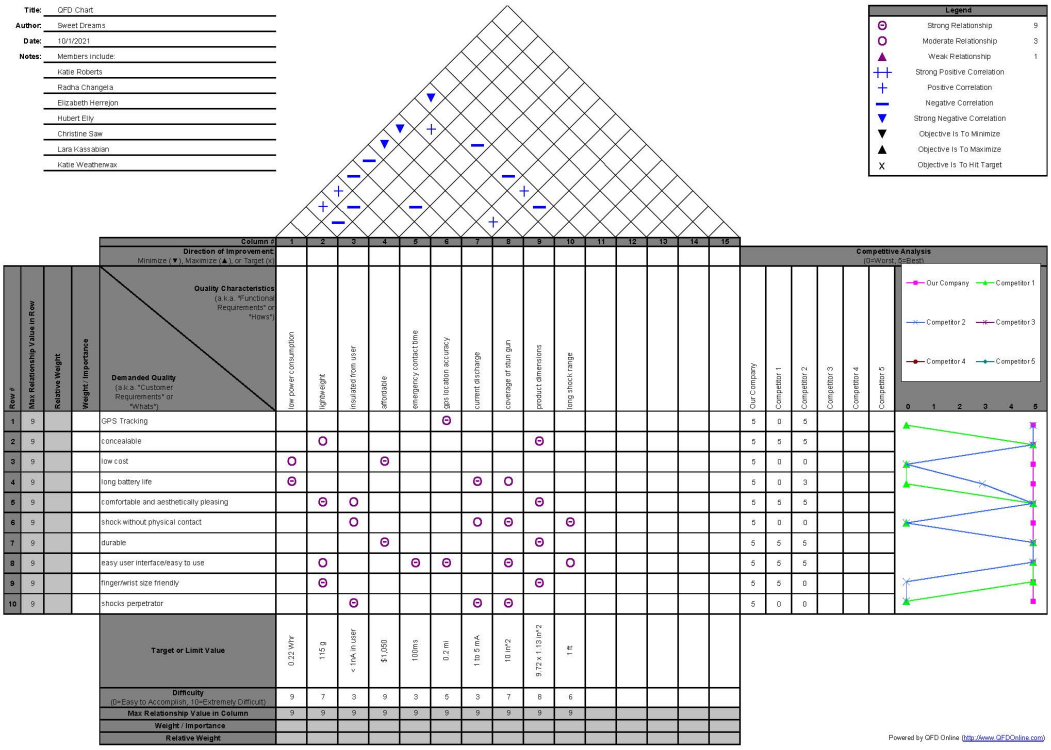


Figure 2: A QFD aligning customer requirements, design elements, and competitor analysis.

The main function of our glove is to shock a perpetrator that attacked the user enough so that the perpetrator is hurt and backs off. The glove's battery lasts a very long time so that the user doesn't need to worry about the battery life or charge the glove after a couple uses. The alert SMS is sent in a matter of seconds after the circuit is discharged (the user pushes the button). The SMS is sent to the correct emergency contacts with an accurate location address.

Several constraints were considered when developing the final prototype of our product. The major software constraint our team encountered was integrating Bluetooth into the app. Additional constraints were that the battery must be charged to use the device. The battery lasts 300 – 500 hours of use and takes 3 –5 hours to recharge. The voltage and current discharge were limited to under 40kV and 1500mA via electrical standards. The electrical components on our glove were built on flexible breadboards to allow the user more flexibility when moving their arm. Lastly, the product will be made in various sizes to accommodate various hand sizes of the users.

2.1 Technical Specifications & Verification

Table 1 contains the engineering specifications that are in the final product design.

Table 1: Engineering Specifications

Technical Specifications	**Measured Values**	**Reasoning**
Low Power Consumption	300-500 hours of use	Longer lasting battery life so that users will be protected for an extended period of time.
Lightweight	142 g	Not cumbersome for the user to wear so they are more likely to wear it for protection.
Insulated from user	$<$1nA in no shock	Insulation is important to protect the user from accidental electrocution or shock.
Affordable	$47 production costs	To expand product outreach, the product would be priced so that more women could afford it as a self-defense object.
Emergency Contact Time	5s	Contacts would be notified as soon as possible so that help can reach the user quickly.
GPS Location Accuracy	4.9m	A higher location accuracy would guarantee higher chances of the user's emergency contacts and the police locating them.
Current Discharge	3mA - 5mA	A high current discharge would deliver more damage to the attacker. However, the current was limited to prevent causing permanent damage to the attacker.
Coverage of Stun Gun	50 sq. in	The wider the coverage of the stun gun, the more pain the attacker would feel, which should reduce the chances of the attacker attacking a second time.
Product Dimension	12in, circumference 15in, length	The product dimension would fit a wide range of users, so it does not slip off and is compact (not bulky for the user to wear).

2.2 Design Concept Ideation, Constraints, Alternatives, and Tradeoffs

There are two main components to the device: the arm of the glove and the fingers of the glove. The arm part of the glove would draw upon many open-source circuits and software. The primary purpose of this component was to hold most of the electrical parts such as the power supply and GPS. The forearm would have most of the components since it would have the most space to work with. It was modeled after a Fitbit but without the heart rate monitor. The stun gun/shocking circuit's main component was a high voltage capacitor/diode chain. The circuit had a switch in it that remained open for regular operation. However, there was also a button on the side of the glove that the user could press when feeling unsafe. This would cause the switch to close, and the capacitor would begin charging. The pressing of the button would also trigger the software to notify the five prechosen emergency contacts that the user felt unsafe. The shocking circuits on the palm of the hand were connected to metal pieces on top of the glove's charging electrodes to complete the stun gun circuit. As soon as the user punched or put pressure on these metal pieces with a certain pressure another switch would be activated in the stun gun circuitry. This would cause the switch to open, allowing the capacitor to discharge and carry the current through the metal designs. The current would then exit from the electrodes on the pieces of metal, shocking the attacker. The user would remain safe as there is a layer of insulation between the user and the rest of the electrical components in the glove.

The idea of stun gun accessories had many constraints in the form of predefined codes and standards. For example, great care had to be taken into setting the output current as it must remain between one to three milliamps. Also, the design must implement specific insulation guidelines to protect the user from getting shocked when punching the attacker.

Multiple design factors were taken into account which influenced our final design:

1. Global: Women's safety is an issue found everywhere
2. Economic: The glove was designed so that it is affordable for our target customer, and an investment they can make in their safety. Our design product the user from the electric shock.
3. Environmental and Sustainability: The materials used in our final product are durable meaning they will last years.
4. Manufacturability: stun gun circuit and Bluetooth circuit fit on PCBs that can be manu-

factured as well as glove outline.

5. Ethical: We kept the current discharge low to prevent long term permanent damage to the perpetrator.
6. Safety: The glove is designed to product the user from an electric shock when discharged.
7. Social: The glove is compact and fashionable so can still be worn in any social setting allowing the user to be protected anywhere at any time.

2.3 Engineering Analyses and Experiment

Research on modern technologies such as prank gum proved that functional shock circuits were entirely possible. The GPS tracking software existed in Fitbits and open-source forums, while the shock circuit existed in prank gum and stun guns. No experiments have been completed at the time of this proposal to determine the reliability of these circuits. However, due to the popularity and reviews of Fitbits, it was predicted that using a GPS tracker with a Bluetooth module worked well. Similarly, with the shock circuit, stun guns and prank gum were widely used and functional. Applying the shock circuit technology of these modern contraptions into the stun gun glove device was possible. Other parts of the device like the GPS tracker were also based on currently available products. To ensure the prototype met specifications and functions as designed, the following tests were conducted:

1. Testing the shock circuit:
   - The voltage and current were measured across the electrodes when a button was pressed to close the circuit.
2. Testing the GPS:
   - Person A moved the prototype to various locations and asked Person B if the GPS displayed the correct locations. Another method included Person A comparing their location displayed from the prototype with another smartphone's GPS map tracking their location.
3. Testing the alert system:
   - Person B entered their phone number into the software. Person A pressed the alert button on the prototype circuit and Person B verified that they received an alert message.

As of this proposal, no formal tests have been conducted with the current prototype. Formal tests would ideally be conducted as soon as next steps or another version of the prototype has been created.

2.4 Codes and Standards

IEEE P360 - IEEE Draft Standard for Wearable Consumer Electronic Devices - Overview and Architecture The IEEE Standard for Wearable Consumer Electronic Devices was significant to our project as it outlined the specific technological requirements to make wearable devices secure and suitable for wear. The code affected our design as it defined technical requirements and testing methods that we would have to follow to make the device safe [2].

IEC 60065 Audio, video and similar electronic apparatus - Safety requirements The International Electrotechnical Commission (IEC) audio, video and similar electronic apparatus - Safety requirements standard was important to our project as it set the maximum voltage and energy discharge of a consumer product. This standard affected our design as it set a limitation on the maximum voltage of our stun gun to about 35–40 kV [3].

IEC 60479-1 2 Effects of current on human beings and livestock The International Electrotechnical Commission (IEC) Effects of Current on Human Beings and Livestock was significant to our project as it explained the thresholds and limits of current that can pass through the human body. With these standards, it explored the safety concerns with each range of current and consequences with as mild as a tingling sensation and as severe as death [4]. Since our accessory has a stun gun, we will be passing a current and a large voltage into a human being and thus our electrical components must be fine-tuned to meet the standards and not cause unnecessary harm. These standards affected our decisions in purchasing components such as capacitors as they must have the correct voltage rating to produce the correct range of current. Measurements that affected these decisions were the average resistance of the human body (provided within the standards' documentation) and the current range the device operated at [5].

UL 69 Standard for Electric-Fence Controllers The UL 69 standard may be meant for electric-fence controllers used only for the control of animals but is still used to verify the safety for Conducted Electrical Weapons (CEW) [6]. During two IEEE conferences, papers were released detailing how the safety of certain CEWs relates to relevant standards, "Electrical safety of conducted electrical weapons relative to requirements of relevant electrical standards" [7] and "New conducted electrical weapons: Electrical safety relative to relevant standards" [8]. Both papers considered the UL 69 standard as it covered portable electric-fence controllers with peak-discharge or sinusoidal-discharge output for battery circuits of 42.4 V or less. Our team is creating a non-lethal weapon; therefore, this standard should be used to verify the safety of our device. These standards detailed load requirements and a current vs. impulse duration graph [8]; too high of a current or a long impulse can have fatal or harmful effects. This will affect our circuit design for the CEW portion of our final product; it is needed to ensure that the final device is safe to use.

3 Project Demonstration

The product was validated by demonstrating the following separately:

- The stun gun circuit was demonstrated
  - qualitatively by creating a spark when the button is pressed
  - quantitatively by measuring the voltage across the transformer with a digital multimeter – 200 volts
- The Bluetooth circuit was demonstrated by using the push button to send a text alert message.
- The GPS functionality was demonstrated by confirming the live location of the user on the app.

The final product's engineering specifications are different from the prototypes in the following ways: The final product is lighter than the prototype by about 50 grams. The emergency contact time is longer at five seconds. The product dimensions are larger than initially designed since the glove extends down the user's arm. Otherwise, the design remained the same from the prototype to the final product.

Throughout the design process, the prototype was continuously tested. During each iteration of the stun gun circuit design, the output voltage was measured with a digital multimeter and visually examined to see if the device produced a spark. The first successful measurement showed that the output was only 50-100 V as seen below in Figure 3.

Figure 3: Multimeter output reading.

4 Schedule, Tasks, and Milestones:

By dividing the team into individual sub teams, the project was able to stay on track with tasks and milestones. The critical path of the experiment was connecting each task with a partner task that allowed for a more efficient course of action. The full Gantt chart can be seen in Appendix A.

5 Marketing and Cost Analysis

5.1 Marketing Analysis

In the United States, 50% of women feel unsafe walking alone at night, and as a result, 34% and 12% of women carry pepper spray and an alarm, respectively [9]. Wearable and concealable self-defense devices and weapons are not a new concept in the current market for this reason. However, each option typically focuses on one distinct feature. The two current products on the market with the same deliverable features as proposed are: InvisaWear and Defender Ring. InvisaWear was designed as a necklace or bracelet with a button that sent the user's location to emergency dispatchers and their friends and family during an emergency [10]. Defender Ring was a ring with a small hidden blade that could be used during an emergency [11]. These products lacked the ability to fight off a perpetrator while notifying emergency dispatchers, including friends and family.

Therefore, by doing market research, the team is able to make the product more readily available and more desirable to the common consumer.

5.2 Cost Analysis (Budget)

The total development cost for a prototype of the Stun Gun glove was approximately $75.93. Table 2 [12] below shows a breakdown of the material costs of different components of the prototype. The costliest equipment was the battery and the transformer which are unique parts so harder to order in bulk.

Table 2: Parts for Stun Gun Glove Prototype

Product	**Quantity**	**Price Per Part**	**Total**
Attiny	2	$1.10	$2.20
Audio Transformer (8:1000)	3	$3.32	$9.96
N-channel MOSFET	3	$0.65	$1.95
555-Timer	2	$0.97	$1.94
Capacitors (10n)	20	$0.46	$9.20
Capacitors (100nF)	5	$1.78	$8.90
Diodes	20	$0.19	$3.80
Studs	1	$7.98	$7.98
Battery	1	$30.00	$30.00
Total			**$75.93**

The development costs shown in Table 3 were determined with an assumed production cost of $46,000. Overhead costs were factored into the higher costs, specifically with Total Cost/Year, and thus, would affect the Total Cost of Year 1 Adjusted Cost and the Cost/Unit. With a total of $-20,312.50 in Total Profit/Year, it would not be until more years go by that we would see a steady decrease in Cost/Unit and an increase in Total Profit/Year. The most laborious process would be the assembly of the product as it was predicted to cost $10,000 in its first year.

Table 3: Development Costs

Project Component	**Base Cost Year 1 (USD)**	**Total Cost Year 1 (USD)**
Production		
Parts	17.00	$17,000.00
PC Board	8.00	$8,000.00
Assembly	10.00	$10,000.00
Packaging	1.00	$1,000.00
Testing	10.00	$10,000.00
Packaging		
Per/Unit	1.00	$10,000.00
Marketing		
Non-Engineering	30,000.00	$2,500.00
Sales		
Non-Engineering	30,000.00	2,500.00
Distribution		
Shipping Per/Unit	1.50	$1,500.00
Shipping		
Non-Engineering	30,000.00	$2,500.00

Using the overheard as 150% of material and labor, the total development cost for the ring stun gun product is $300,781.25, as shown below in Table 4.

Table 4: Total Development Costs

	Base Cost Year 1 (USD)	Total Cost Year 1 (USD)
Parts	$89.52	$120,312.50
Overhead	$47.00	$180,468.75
Adjusted Cost		$300,781.25
Cost/Unit		$120.31
Total Profit/Year		$-20,312.50
Total Profit		$373,137.50

The production run will consist of 1000 units sold over a 5-year period at a price of $100.00 per unit. A group of seven engineers will be employed to work a total of $65,000.00 in the first base year. Sales expense, or marketing and advertising, will make up 6% of the final selling price. With the current prediction of the unit price, the expected revenue is $373,137.50.

6 Conclusion & Current Status

Thus far, the team has designed a prototype of the stun gun glove which is the result of a detailed design process, and included multiple ideation cycles to create a self-defense wearable.

This solution was designed to be discrete, concealable, durable, user-friendly, comfortable and affordable for the target market. The final design met the target for output voltage at 40kV and a current discharge of 3mA - 5mA and fulfills other relevant customer requirements and engineering specifications.

A key conclusion is that the stun gun glove is an efficient solution to the design problem. A low power consumption resulting in 300-500 hours of use and output voltage of 40kV and current discharge of 3mA to 5mA ensures that the glove is both low energy and effective. The gloves also connect to the user's device through a customized mobile app that boasts an immediate emergency contact outreach time of 5 seconds. Along with the above-mentioned features, the glove remains fairly lightweight at 142g and compact at 12 inches in circumference and 15 inches long. The affordability of the product will also allow for a wide product outreach to the target market with a low production cost of $47. The efficacy of this glove demonstrates the promise for user safety to address a variety of safety concerns.

Future work may be performed in several key areas. First, the stun gun circuit would need to be placed on a polished PCB rather than on a breadboard to reduce moving parts while keeping the glove as compact and lightweight as possible. Next, a GPS module would need to be added to the glove to give it location services. Thirdly, the mobile app would require an additional feature that allows Bluetooth devices to connect to it. The glove would need to connect to the app using Bluetooth. Ideally, with the trigger of a button on the glove, the glove would alert the users' list of emergency contacts through SMS that the user is in danger, and the message would include the user's GPS data.

Additional future work would involve registering an SMS Short Code to send alert messages from the glove instead of using the user's local mobile device. Next, registering a navigation map API such as Google Map API for usage within the mobile app would be ideal instead of using the user's mobile device's native navigation app. This would allow all required functionalities to be contained within the mobile app and reduce complexity. Lastly, the mobile app would be improved with more interactive features such as self-defense tips, guides, and video tutorials.

7 Leadership Roles

To better organize the project, each member of the team had been assigned a leadership role. While all members collaborated to accomplish the tasks of each role, the leader of each role was held accountable should the tasks assigned to their role failed to be accomplished on time. The current leadership roles and the corresponding tasks were assigned as follows:

- Webmaster (Christine Saw): maintaining the product and contact information website
- Expo Coordinator (Katie Weatherwax): organizing and coordinating the end-of-term exposition
- Documentation Coordinator (Radha Changela): documenting project progress and results
- Team Leader and Financial Manager (Katie Roberts): keeping track of the project deadlines and making sure all team members are doing their job; making and managing the budget
- Electrical Engineering Lead (Lara Kassabian): designing, assembling, and testing electronic circuits
- Software Engineering Lead (Hubert Elly): developing the backend of the Bluetooth device
- Android Developer (Elizabeth Herrejon): developing accompanying Android phone app

References

[1] T. P. H. Charlene L. Muehlenhard, Zoe D. Peterson and K. N. Jozkowski, "Evaluating the one-in-five statistic: Women's risk of sexual assault while in college," *The Journal of Sex Research*, vol. 54, no. 4-5, p. 549–576, 2017.

[2] "IEEE p360 - IEEE Draft Standard for Wearable Consumer Electronic Devices – overview and Architecture," *IEEE SA - The IEEE Standards Association - Home*. [Online]. Available: https://standards.ieee.org/project/360.html.[Accessed:10.29.2021]

[3] "IEC 60065:2014, Audio, video and similar electronic apparatus - Safety requirements," *IEC Webstore*. [Online]. Available: https://webstore.iec.ch/publication/494.[Accessed:04.29.2022]

[4] "Effects of current on human beings and livestock - part 1: General aspects," *IEC 60479-1:2018 | IEC Webstore*, Dec. 2018. [Online]. Available: https://webstore.iec.ch/publication/62980[Accessed:04.20.2022]

[5] "IEC 60601-1 Medical Design Standards for Power Supplies," *CUI Inc*, Jul. 2020. [Online]. Available: https://www.cui.com/catalog/resource/iec-60601-1-medical-design-standards

[6] U. Laboratories, ser. UL Standard for Electric-Fence Controllers. Northbrook, IL: UL Laboratories, 2009, vol. UL 69 10th ed.

[7] M. N. D. Panescu and M. Kroll, "Electrical safety of conducted electrical weapons relative to requirements of relevant electrical standards," *2013 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 5342–5347, 2013.

[8] M. W. K. D. Panescu, M. Nerheim and M. A. Brave, "New conducted electrical weapons: Electrical safety relative to relevant standards," *2017 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 2185–2190, 2017.

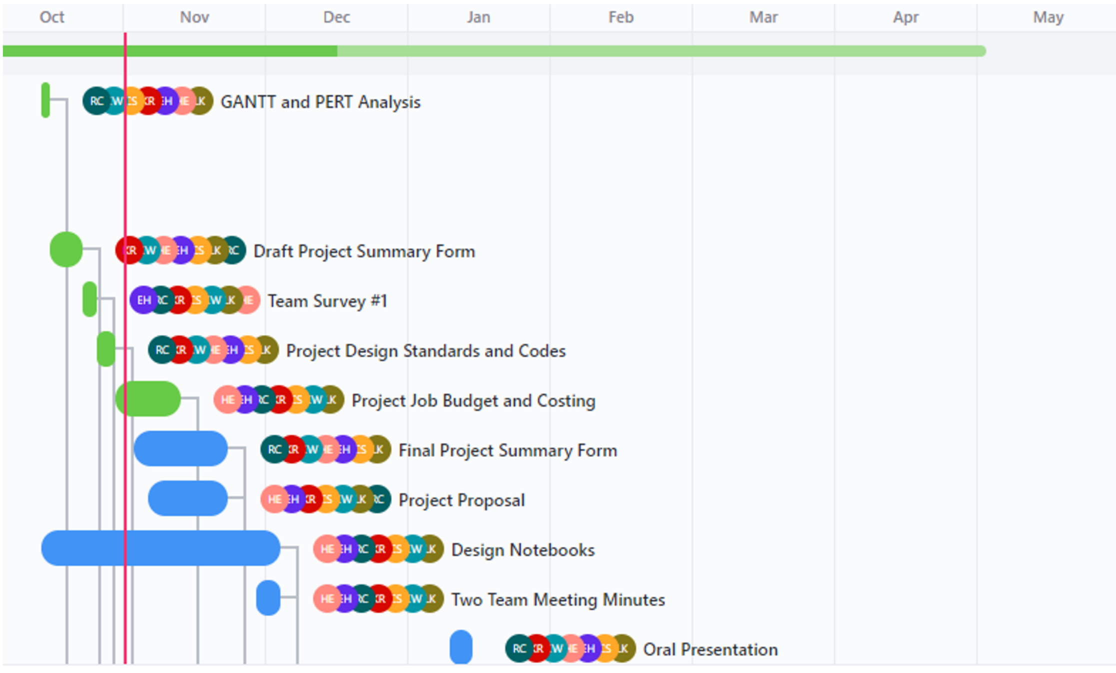
[9] J. Ballard, "Most women say they regularly take steps to avoid being sexually assaulted," *YouGov*, Mar. 2019. [Online]. Available: https://today.yougov.com/topics/lifestyle/articles-reports/2019/03/28/women-safety-sexual-assault-awareness

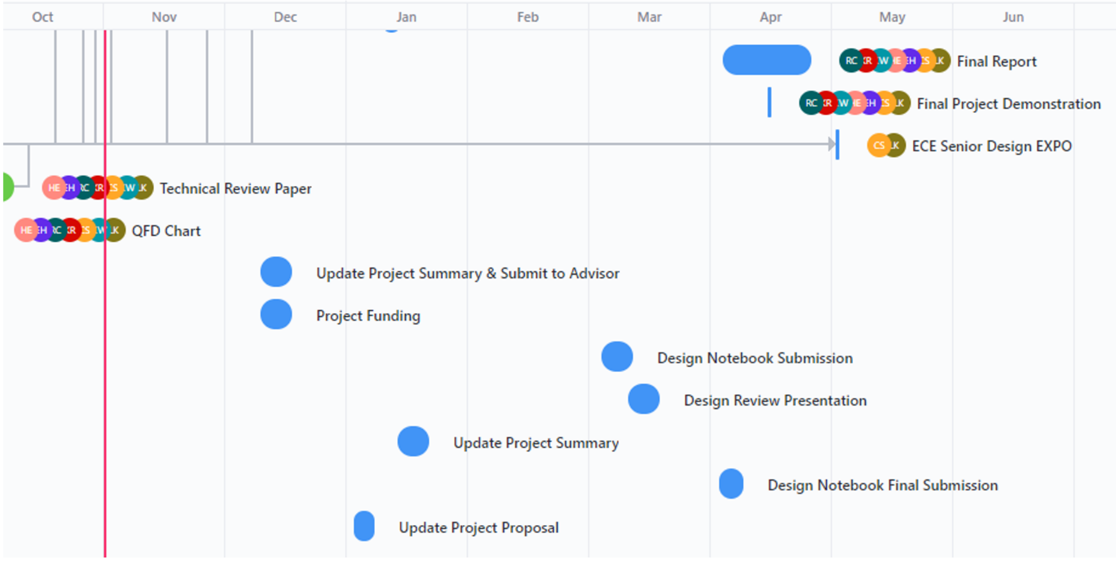
[10] "Invisawear smart jewelry, stylish panic button, wearable safety device," *InvisaWear*. [Online]. Available: https://www.invisawear.com/[Accessed:11.19.2021]

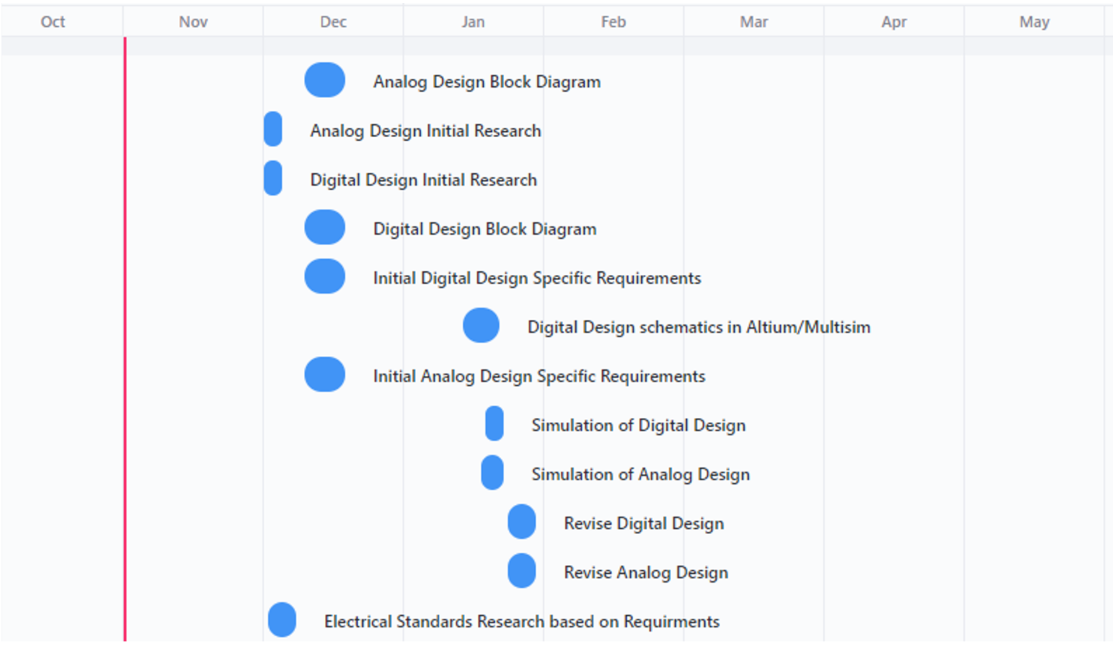
[11] "Self-defense ring amp; self-self-defense jewelry," *Defender Ring*. [Online]. Available: https://www.defenderring.com/[Accessed:11.19.2021]

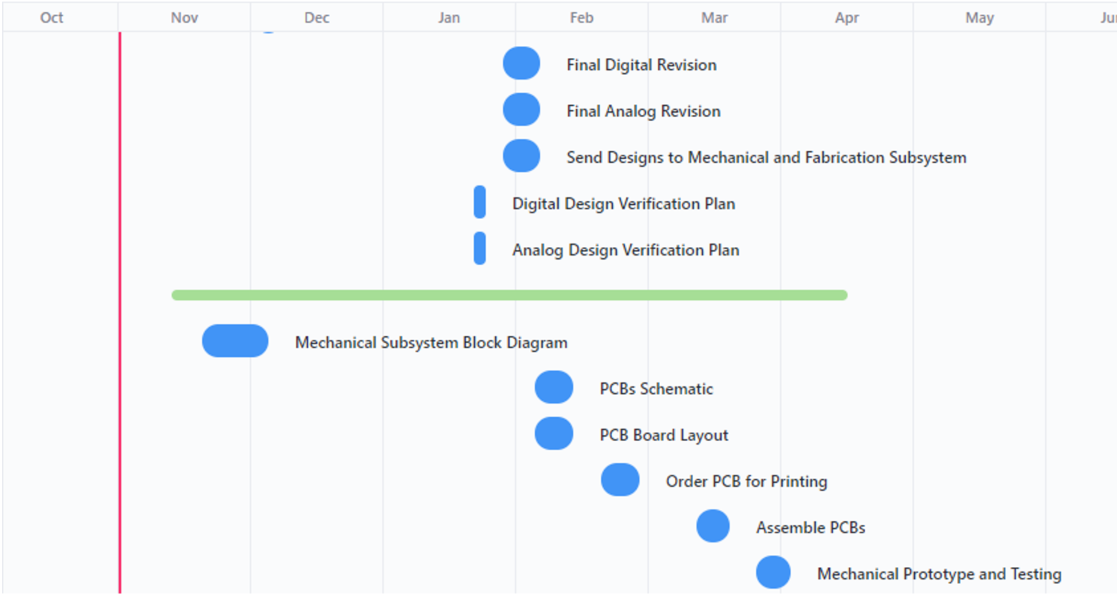
[12] "I. E. Media. Teardown: Fitbit Flex." [Online]. Available: https://electronics360.globalspec.com/article/3128/teardown-fitbit-flex/[Accessed:11.18.2021]

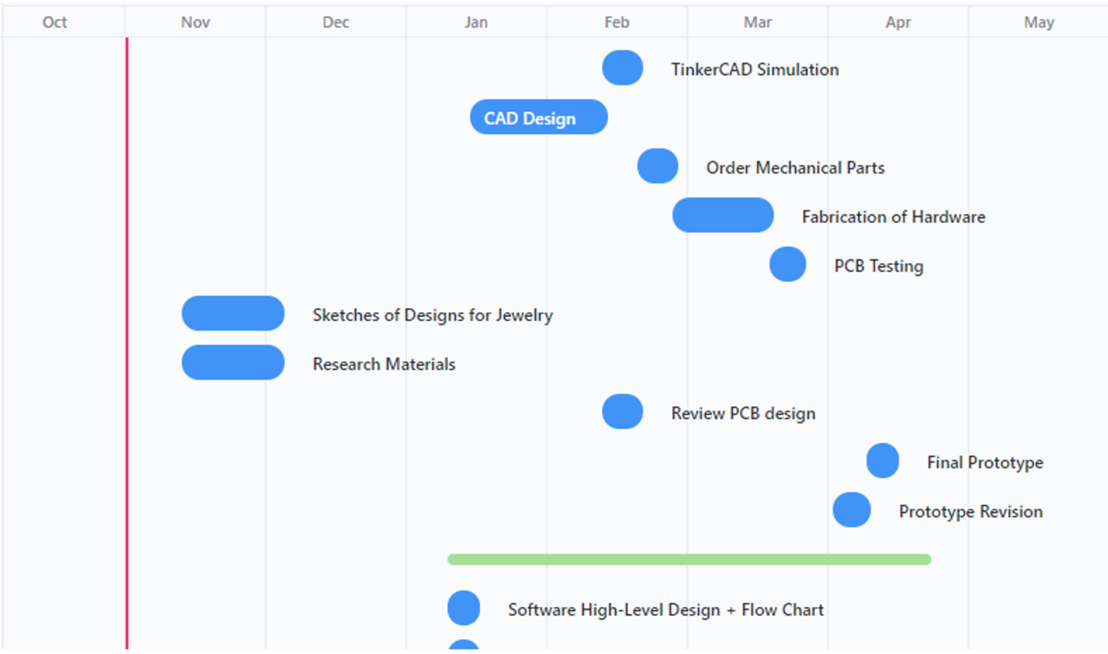
Appendix A: Gantt Chart

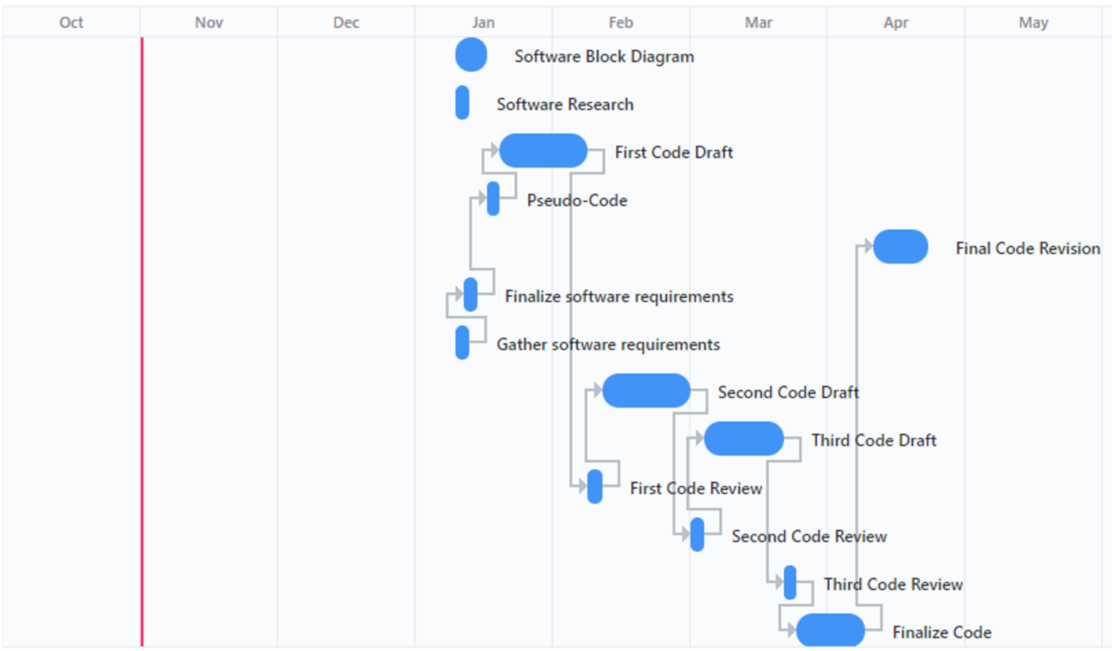



Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Final Report
Final Project Demonstration
ECE Senior Design EXPO
Technical Review Paper
QFD Chart
Update Project Summary & Submit to Advisor
Project Funding
Design Notebook Submission
Design Review Presentation
Update Project Summary
Design Notebook Final Submission
Update Project Proposal


Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Analog Design Block Diagram
Analog Design Initial Research
Digital Design Initial Research
Digital Design Block Diagram
Initial Digital Design Specific Requirements
Digital Design schematics in Altium/Multisim
Initial Analog Design Specific Requirements
Simulation of Digital Design
Simulation of Analog Design
Revise Digital Design
Revise Analog Design
Electrical Standards Research based on Requirments


Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Final Digital Revision
Final Analog Revision
Send Designs to Mechanical and Fabrication Subsystem
Digital Design Verification Plan
Analog Design Verification Plan
Mechanical Subsystem Block Diagram
PCBs Schematic
PCB Board Layout
Order PCB for Printing
Assemble PCBs
Mechanical Prototype and Testing


Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
TinkerCAD Simulation
CAD Design
Order Mechanical Parts
Fabrication of Hardware
PCB Testing
Sketches of Designs for Jewelry
Research Materials
Review PCB design
Final Prototype
Prototype Revision
Software High-Level Design + Flow Chart


Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Software Block Diagram
Software Research
First Code Draft
Pseudo-Code
Final Code Revision
Finalize software requirements
Gather software requirements
Second Code Draft
Third Code Draft
First Code Review
Second Code Review
Third Code Review
Finalize Code