Fall 2025 ECE 445 Team Contract

Instructions: The content of this document should be specific to your goals and needs. Ideas for the content of each section are provided as suggestions.

Project No. and Name	**31. NeuroGuard**
Member Name, netID	Aidan Moran, afmoran2
Member Name, netID	Alex Krejca, akrejca2
Member Name, netID	Stephen Simberg, simberg3

ECE 445 is a project-based course. The course includes both team and individual grades. Project teammates generally all get the same grade for team assignments based on the expectation that all team members do their fair share of the work involved. The purpose of this contract is to lay out the tasks needed for the successful completion of the project and distribute them in a fair and efficient way to the team members. It will also discuss how the teammates will work together during the project and address any issues that come up. A contract that promotes good teamwork that leads to a successful project should:

- Acknowledge that each team member has commitments and responsibilities outside of ECE 445
- Encourage open communication about challenges that team members are facing, both in and out of ECE 445
- Give team members the benefit of the doubt and the opportunity to explain themselves when something goes wrong and resist jumping to judgement

Project Description:

The NeuroGuard project is focused on the hardware design and implementation of a novel surgical tool module. The project is the engineering and design of a device that can safely interface with a high-voltage (~2000V) electrosurgical unit (ESU) while modulating its output. The device will be designed to step down the ESU's energy, store it, and then generate a precise, low voltage, pulsed waveform suitable for neurostimulation. This project is a proof of concept for the hardware platform, demonstrating the capability to integrate power conversion and waveform generation that could be used with a standard cautery probe. The scope is strictly limited to the development and testing of this hardware; the detection of neural activation and the development of a feedback mechanism are considered future work beyond the scope of this project.

Project Goals: *If the team is successful in its purpose, what hardware and software achievements will attest to this?*

Neurostimulatory Waveform Generation: Create a stable circuit to produce the specific waveform required for nerve stimulation.

Pulsed Current Delivery System: Implement a power MOSFET and supercapacitor circuit capable of delivering the pulsed current waveforms for neuron detection.

Custom PCB and microcontoller: Develop firmware for a microcontroller, and design and fabricate a custom PCB that interfaces with HW to detect when to alternate between the standard cautery function (pass-through) and the neurostimulation waveform generation.

High-Voltage Power Conversion (If safe design and testing can be done): Design, build, and validate a robust power converter system capable of safely stepping down the ~2000V AC output from an ESU power supply to a 5V DC rail for powering onboard logic. This system will include a high-voltage inverter and transformer stage to reduce the voltage to an intermediate AC level (~100V), followed by a rectifier and buck converter for the final 5V output.

Testable Subsystems: Develop and document safe, isolated subsystems for testing each major hardware block (high-voltage input, intermediate conversion, low-voltage output, pulse generation) independently before full system integration.

Expectations (ground rules) for each member: *Try to list six or more minimum expectations. Consider aspects such as preparation, participation, feedback, responsiveness, etc. Try to explicitly list anything that could potentially turn into a problem. Find ways to encourage everyone to communicate (this may also fall under "tasks").*

1. Arrive at all scheduled meetings on time, having completed any assigned tasks and prepared to discuss progress, challenges, and next steps for your hardware subsystem.
2. Respond to team members within 24 hours to encourage speedy communication and well-timed feedback.
3. We will hold formal design reviews before any PCB fabrication or major component purchase. All members to provide constructive feedback on each other's schematics and layouts.
4. All schematics, PCB layouts, firmware, and test results will be maintained in a shared GitHub repository for ease of access and not hard to find scattered across multiple sources.

5. Significant issues or delays must be communicated to the team as soon as they are discovered to not create scares or unknowns between team members about the status of a project and wrong information being relayed.
6. When providing feedback on another member's design, start by stating what you like or what works well before suggesting improvements. All feedback must be directed at the work, not the person.

Roles: *Do you see this team performing well because everyone works together and contributes equally? Are there certain aspects of the project that some teammates excel at? Can tasks be spread among individuals to optimize progress toward the final product?*

Every team member should have knowledge on the ongoing status of every system in the project. All team members should approve the design/change in design of a subsystem. Aidan and Alex are knowledgeable in Power Electronics and will be more responsible for Power Conversion and Waveform Generation. We will focus on the 100V AC to start and create the 2000V to 100V high voltage converter once the other parts of the system have been tested as the 2000 to 100V system is the most dangerous to create and test. Stephen has more knowledge in Embedded Systems and will be more responsible for the Microcontroller side of the project. Each group member will also oversee the final assembly and system-level testing.

Project Meeting Time(s): *The team will meet at the scheduled team meeting with TA each week. Can you also preset an ideal time for team meetings in the lab (your team may need to sign up for lab bench access)? Is your team interested in meeting to work on other aspects of the course together such as project research?*

Weekly TA Meeting: At 2:30-3:00 Thursdays.

Weekly design & sync meetings on Mondays at 6:00 PM

(Subject to Change) Wednesdays and Thursdays from 3:00 PM to 6:00 PM will be our core times for hands-on assembly, testing, and debugging in the lab.

The team will also hold weekly brainstorming sessions during the weekly design & sync meetings as needed to hash out the design of a subsystem, or debug a component.

The team will schedule additional meetings as required for component sourcing, design reviews, or intensive debugging sessions.

Agenda: *Who will set the agenda? Beyond the weekly meetings with the TA, what will the team do to ensure that it stays on track during the semester? When a decision*

needs to be made, will it be approved by consensus or majority vote? Will a team member be appointed to keep records?

We will hold weekly design & sync meetings on Mondays at 6:00 PM. This meeting will be for reviewing schematics, discussing integration challenges, and planning the week's tasks.

We will use a shared task board with columns for "To-Do," "In Progress," "In Simulation," "In Test," and "Complete." This will provide clear visibility into the status of each subsystem.

All major hardware design decisions like component choices, and PCB layout will be unanimously agreed upon. Other project decisions will be made by majority vote.

Stephen will document key decisions and action items from each meeting in a project log on the shared github repository.

Process and penalties for dealing with team issues: What happens when ground rules are broken? Who intervenes? What happens if the situation escalates? Always remember not to jump to judgement. Give group members the benefit of the doubt and the opportunity to explain themselves when something first goes wrong. TAs and instructors are available to help resolve issues.

When providing feedback on another member's design, start by stating what you like or what works well before suggesting improvements. All feedback must be directed at the work, not the person.

1. If an issue arises, the team member should first speak directly and privately with the other team member involved if possible to seek an understanding and resolution.
2. If a direct, private conversation is not successful/possible, the issue can be brought up in the Team meeting on Mondays or with the TA. The entire team will discuss the problem and agree on a fair solution.
3. If the situation seems like it needs to be resolved ASAP, a secondary meeting with the TA will be scheduled to mediate and solve the problem quickly.
4. As a final resort, if the issue continues after TA mediation, the team will escalate the matter to the course instructor.

End-of-term agreement on using final peer assessment for grade adjustment: Do you believe that this contract should hold your team accountable to its contents or that it may hold little value? There will be two formal peer assessments this

semester. The first is used only to provide honest, constructive feedback to each team member. The second peer assessment affects a teammate's grade. Without accountability, many promises go by the wayside.

We agree that this contract will allow our team to operate successfully over the course of the semester. We agree to formal peer assessments and believe this contract will hold the team accountable for the materials within this document.

Signatures: Iterate on this document until everyone is comfortable with its contents and signs (it is okay to type your printed name as your digital signature).

I affirm that I participated in generating this team charter and that I will abide by its contents to the best of my ability. Furthermore, I understand that failure to meet the expectations expressed here can lead to the stated consequences.

netID: **akrejca2**	(digital) Signature: **Alex Krejca**	Date: **09/19/2025**
netID: **afmoran2**	(digital) Signature: **Aidan Moran**	Date: **09/19/2025**
netID: **simberg3**	(digital) Signature: **Stephen Simberg**	Date: **09/19/2025**