

The Semester Long Design Project

The semester-long design project (SLDP) is the bedrock of EG-UY 1004. Each project will require teams of 3-4 students to build a physical prototype of a solution to an engineering problem. In constructing the physical prototype, the teams will rely on skills taught in the Skills Workshop series. At the end of the semester, teams will demonstrate their physical prototype for their section instructors and their peers.

The SLDP is worth 50% of the final grade in EG-UY 1004 (for a full description of grading policy, please [visit this page](#)), divided into assignments listed in Table 1. Descriptions of each assignment can be found below, under Project Timeline and Requirements. All assignments related to the SLDP will receive a group grade.

Table 1. SLDP Assignment and Grade Values

Assignment Title	Grade Value (%)
Benchmark A	2.50%
Benchmark B	2.50%
Commissioning & Submission	7.50%
Milestone 1 Presentation	2.50%
Milestone 2 Presentation	2.50%
Milestone 3 Presentation	2.50%
Final Presentation	7.50%
SLDP Technical Memo 1	2.50%
SLDP Technical Memo 2	2.50%
SLDP Technical Memo 3	2.50%
Final Design Report	7.50%
Project Workshop Attendance	3.50%
Poster Session Attendance	0.50%
MakerSpace Orientation	0.50%
CATME Peer Evaluations	3.00%

Project Timeline and Requirements

The SLDP will kick off during Week 1 of the semester and end in Week 14. Please refer to the [section schedules](#) for dates specific to each section. While Project Workshops provide class time for the SLDP, teams are expected to meet regularly outside of class time to work on their projects.

Phase 1: Project Selection (Weeks 1-4)

At the start of the semester, recitation instructors will assign students to teams. Each team will represent an imaginary company that will respond to the General Engineering Design Challenge.

Together, your team will prepare a project application that responds to the [General Engineering Design Challenge](#). Teams will propose three ideas that align with any of three project tracks ([Sustainability, Engineering & Culture](#), and [Entrepreneurship, Design, & Innovation](#)). EG-UY 1004 faculty and mentors will review all applications and assign each team to one of the projects proposed. The criteria for selection will be the innovation of the proposed project, its costs and required resources, and its feasibility within the duration of the semester.

Once a project has been selected, lab mentors will communicate the selected project to the team and provide them with a shared Google Drive folder with resources for getting started. This folder will be shared among lab mentors, recitation instructors, and students, and it is where all work for the SLDP must be saved.

Phase 2: Research and Planning (Weeks 5-7)

From Weeks 5-7, teams will create a plan for designing and building their prototype. During Project Workshop 1 (Week 5), teams will meet with their lab mentors to outline their plan, identify appropriate resources, and discuss upcoming deadlines. Teams will commence their projects, applying skills from Skills Workshops 2-4 to develop their plan. Teams will be evaluated through Benchmark A, their Milestone 1 Presentation, and an SLDP Technical Memo.

Teamwork Agreement

Teams will submit a teamwork agreement the night before Skills Workshop 5 (Week 6). A teamwork document is a contract among all team members that outlines expectations for each teammate and processes for holding each teammate accountable for the SLDP. The teamwork agreement should follow this [template](#). All team members are responsible for all deliverables related to the SLDP. Team members are expected to collaborate and support one another in completion of their tasks. Teams will periodically complete [teamwork evaluations](#) that allow members to reflect on their experiences throughout the semester and provide each other with constructive feedback on their participation.

Milestone 1 Presentation Requirements

Milestone 1 is a presentation of the project plan. Teams will define the problem that they plan to solve, present a review of existing solutions, and the proposed solution that they will develop. Teams should highlight the innovation behind their proposed solution – for example, highlighting if it is a brand new concept, or how it improves upon existing solutions. Milestone 1 will be graded according to [this rubric](#).

Teams will deliver Milestone 1 in recitation (Week 6). The presentation will be a 5-minute presentation that must include the following:

- An introduction of the team's company, its members, and member roles

- A statement of the problem that the company plans to solve
- Background information on the problem, addressing existing solutions and their pitfalls
- A description of the engineering solution the company will pursue, including:
 - The key functions of the proposed product
 - The imagined users of the solution
 - Its main components, such as the sensors and microcontrollers it will rely on
 - Preliminary CAD models (top, front, most detailed side, and isometric views)
 - Preliminary circuit diagram and code flowchart that show how components will interact
 - Estimate of material costs
- A summary and description of next steps, highlighting:
 - Testing that will be completed
 - Resources required for next steps (such as training, purchases)

SLDP Technical Memo 1 Requirements

Technical Memo 1 requires teams to research real-world information regarding the prototype that they intend to build.

SLDP Technical Memo 1 will be due the night before Skills Workshop 5. The memo must be a one-page, double spaced document that details responds to the following prompt:

Begin to collect and research real-world information regarding the product and the people that believe would benefit from, or wish to use, this product. The kinds of information collected will differ depending on the product itself. What evidence is there that the proposed solution is better than any that currently exist? [Refer to this page for more details.](#)

Benchmark A

Lab mentors will evaluate Benchmark A during Project Workshop 2 (Week 6). Benchmark A will require a check of the teams' Google Drive folder. While the specific components and designs of prototype will vary by team, all teams must be prepared to show their lab mentors the following:

- Preliminary CAD models of prototype (top, front, isometric, and most detailed views, .fp3d)
- A CAD model and 3D printer file (both an .stl and .3mf) of a company emblem**
- Preliminary circuitry diagrams and code flowcharts that communicate the proposed design of the prototype
- Preliminary inventory of components (such as sensors and microcontrollers to use) and software libraries needed to build the prototype
- Preliminary project schedule, with tasks delegated, deadlines listed, and task status updated
- Updated engineering notebook, that includes a preliminary design description and testing plan for Weeks 8 - 10

****Teams must design an emblem, or an object that represents their company. By Benchmark A, teams should submit their CAD file to the EG website for review by a TA. The emblem must fit the following criteria. [Refer to this page for more details.](#)**

Phase 3: Testing and Assembly (Weeks 8-11)

From Weeks 8-11, teams will execute their testing plan and build their initial prototype. During Project Workshop 3 (Week 9) and Project Workshop 4 (Week 10), teams will meet with their lab mentors to present their progress and plan towards demonstration and dissemination. Teams will evaluate the plan through Benchmark A, their Milestone 1 Presentation, and SLDP Technical Memos 2 and 3.

Milestone 2 Presentation Requirements

Milestone 2 is a project progress update. Teams will reintroduce their company and project goals. Teams should provide an updated description of the design and discuss the testing performed on components. Milestone 1 will be graded according to [this rubric](#).

Teams will deliver Milestone 2 in recitation (Week 10). The presentation will be a 5-minute presentation that must include the following:

- A reintroduction of the team's company member and roles
- A summary of the background information on the problem, highlighting comparable solutions
- An updated description of the engineering solution the company will pursue, including:
 - Updated CAD models (top, front, most detailed side, and isometric views)
 - Photos of the in-progress prototype
 - Updated circuit diagram and code flowchart that show how components will interact
 - Discussion of data collected on sensors, highlighting accuracy and precision, and discussing any challenges
 - An updated estimate of material costs, with comparison to costs from Milestone 1
- A summary and description of next steps, highlighting:
 - Plan for assembly and next steps for testing
 - Resources required for next steps (such as training, purchases)

SLDP Technical Memo 2 Requirements

Technical Memo 2 requires teams to compare their prototype to others on the market.

SLDP Technical Memo 2 will be due the night before Skills Workshop 6 (Week 8). The memo must be a one-page, double spaced document that details responses to the following prompt:

Review comparable products to the prototype the team has developed. Note the price, materials, and availability of each product. Then, write two to three brief paragraphs comparing each one to the prototype to the one developed. Finally, write one more paragraph describing the product and how the product will be an improvement upon, or a better alternative to, the designs created. [Refer to this page for more details.](#)

SLDP Technical Memo 3 Requirements

Technical Memo 3 requires teams to compare their prototype to others on the market.

SLDP Technical Memo 3 will be due the night before Project Workshop 4 (Week 10). The memo must be a two-page, double spaced document that details responds to the following prompt:

Review SLDP Technical Memo 1 and SLDP Technical Memo 2. Write a brief explanation of the design progress geared towards a potential investor. Use the statistics, research, and information gathered over the semester to help this investor understand the design rationale behind the project. This may include data, training, certifications, training, and other relevant information. [Refer to this page for more details.](#)

Benchmark B

Lab mentors will evaluate Benchmark B during Project Workshop 4 (Week 10). Benchmark B will require a check of the teams' Google Drive folder. While the specific components and designs of project will vary by team, by the end of Project Workshop 4, teams must be prepared to show their lab mentors the following:

- Updated CAD models (top, front, most detailed side, and isometric views)
- A CAD model and 3D printer file (.stl, .3mf) of a company emblem
- Updated circuitry diagrams and code flowcharts that communicate the proposed design of the prototype
- Updated project schedule, with tasks delegated, deadlines listed, and task status updated
- Updated engineering notebook, that includes data collected to date, and an updated testing plan for Weeks 8 - 11

Phase 4: Demonstration and Dissemination (Weeks 12-14)

From Weeks 12-14, teams will complete the assembly of their prototypes and prepare a poster, report, and presentation for final dissemination of their projects. Teams will be evaluated through Commissioning and Final Submission, their Milestone 3 Presentation, poster presentation, final design report, and final presentation.

Commissioning and Submission

Lab mentors will evaluate the completion of commissioning during Project Workshop 6 (Week 12). Commissioning will require a check of the teams' Google Drive folder and demonstration of the project. Teams must complete commissioning of their prototype for their lab mentors by the end of Project Workshop 6; no late commissioning is allowed.

Once a team has commissioned their project, they can submit their project by uploading the following to their Google Drive:

- Final CAD models (top, front, isometric, and most detailed side views)
- Photos of final prototype (top, front, most detailed side, and isometric, and most detailed side views)

- Video of a live demonstration of the final prototype
- 3D printed company emblem
- Final circuitry diagrams and code flowcharts that communicate the proposed design of the prototype
- Final project schedule
- Final engineering notebook

Teams must submit their projects by the end of Project Workshop 7 (Week 14).

Milestone 3 Presentation

Teams will deliver Milestone 3 in recitation (Week 10). The presentation will be a 5-minute poster presentation. **Teams must bring their physical prototype with them to class for this poster presentation.** The poster must be a single, 24" x 36" slide [based on this template](#) and includes the following:

- The company's name, members, and roles
- A summary of the background information on the problem
- A complete description of the engineering solution the company will pursue, including:
 - Final CAD models (most detailed sideviews)
 - Photos of the final prototype (most detailed sideviews)
 - Final circuitry diagrams and code flowcharts that communicate the design of the prototype
 - Findings from final testing of the prototype, such as its accuracy and precision
- Steps for future development of the prototype, should the team have additional resources to pursue the project

Examples of posters can be found [here](#). Engineering faculty and recitation TAs will evaluate posters according to [this rubric](#).

Final Design Report

The Final Design Report (FDR) requires teams to provide a comprehensive overview of the prototype process and description of the final prototype created.

The FDR will be due at the time of submission (Week 14) and must be uploaded to the EG website. The FDR must use [this template](#) and include:

- Introduction:
 - 1.1 Purpose of Project:
 - A description of the team's company, its members, and member roles
 - A statement of the company's mission and problem that the company hopes to solve
 - 1.2 Background Information:
 - Discussion on the problem the company prototype sought to solve, addressing existing solutions and their pitfalls

- A discussion highlighting how their prototype is innovative - either improving on existing solutions or proposing a new solution to the problem
 - A description of the key functions of the proposed product and the intended users of the solution
- Requirements
 - 2.1 Physical Components:
 - A description of the engineering solution the company created, including:
 - The sensors and microcontrollers the prototype relies on
 - Final CAD models (top, front, most detailed side, and isometric views)
 - Total final material costs of the project
 - 2.2 Software Components:
 - Software requirements (ex. Arduino IDE, any libraries required)
 - A description of final circuit diagram and code flowchart that show how components will interact
- Procedure
 - 3.1 Physical Construction:
 - A description of how the physical prototype was assembled
 - 3.2 Software Setup:
 - A description of the software setup for any code used, such as modification of any libraries required for the project
 - 3.3 Software Troubleshooting
 - A description of any notes regarding troubleshooting the code in case of any user issues encountered
- Milestone and Final Product Requirements
 - 4.1 Benchmark A Requirements:
 - Discussion of Benchmark A requirements
 - 4.2 Benchmark B Requirements
 - Discussion of Benchmark B requirements and the results of the evaluation
 - 4.3 Commissioning Requirements
 - Discussion of Commissioning requirements and the results of the evaluation
 - 4.4 Human Resources and Training:
 - A summary of any training and expertise required (for example, role a mentor played; team members who received equipment training from the MakerSpace)
- Conclusion
- Results:
 - 5.1 Benchmark A Results
 - Discussion of Benchmark A evaluation results
 - 5.2 Benchmark B Results
 - Discussion of Benchmark B evaluation results
 - 5.3 Commissioning Results
 - Discussion of Commissioning evaluation
 - 5.4 Difficulties Experienced
 - Discussion of experience with the design process, reflecting on any challenges with the developed prototype
- Conclusions
 - 6.1 Results of Project:

- Summary of prototyping process, reiterating the final design achieved and any limitations of the design
- 6.2 Future Improvements:
- Discussion of future improvements to the the prototype, if further resources (time, funding, etc.) were available
 - Works Cited

Here is the [writing faculty rubric](#) and [recitation TA rubric](#) for the final design report.

Final Presentation

The final presentation is a pitch of the prototype to “investors”, played by the recitation TA, engineering faculty, and writing faculty. Teams will reintroduce their company and project goals. Teams should provide a demonstration of a functioning prototype.

Teams will deliver the Final Presentation in recitation (Week 14). The presentation will be a 5-minute presentation that must include the following:

- A reintroduction of the team's company members, roles, and mission, incorporating the company's designed emblem
- A summary of the background information on the problem, the potential market, and highlights of comparable solutions from competitors
- A complete description of the engineering solution the company will pursue, including:
 - Final CAD models (top, front, isometric, and most detailed sideviews)
 - Photos of the final prototype (top, front, isometric, and most detailed side, and isometric views)
 - Final circuitry diagrams and code flowcharts that communicate the proposed design of the prototype
 - Relevant metrics that performance of the prototype
 - Cost and, for Entrepreneurship, price of the prototype
- A demonstration of the prototype
- Steps for future development of the prototype, should the team have additional resources to pursue the project

Poster Presentation and Showcase

All teams will present a revised version of their Milestone 3 Presentation during a poster session during Lecture 14 (Week 14). Attendance is mandatory for all team members.

During the poster session, selected teams will have their posters judged by a panel of faculty and teaching assistants for selection to the SLDP Showcase. A panel of engineering faculty and EG-UY 1004 TAs will evaluate posters according to [this rubric](#). Due to limited time and space, participation in the SLDP showcase requires an application from all interested teams. The application requires:

- Successful completion of Benchmark B
- CAD renderings of the design in Fusion 360

- Photos and/or videos of the prototype
- A draft of the Milestone 3 Presentation

The top six teams will be selected to present their final presentations to a panel of faculty and TAs. These teams will compete for the Gunter Georgi Award. This award, named after a former director of EG-UY 1004, celebrates excellence in design, innovation, and entrepreneurship. Recipients of the Gunter Georgi Award will receive \$100 per team member. A panel of engineering faculty and EG-UY 1004 TAs will evaluate the presentations according to [this rubric](#).

Additional Resources

- [Introduction to the Semester-Long Design Project Lecture](#)
- [Introduction to the Semester-Long Design Project Slides](#)

Appendix A. Google Drive Resources

Project Schedule

Each team must create a project schedule using the provided Google Sheets [template](#) and [guide](#). This schedule must include all tasks related to the project from the start of the project until submission, such as the following:

- All project related tasks including benchmarks and milestones
- Break down each task to its constituent parts
- Milestones should be clearly indicated on the project plan (duration of zero days)
- Each task must include the person responsible for completing the task (resource names)
- Gantt chart must be displayed alongside the tasks list (fit onto one slide)

Engineering Notebook

Starting from Week 5, all teams must maintain documentation of their project progress over the course of the semester. Please refer to this [template](#) and [checklist](#) for what must be included in the engineering notebook. Notebooks will be reviewed at Benchmark A, B, and commissioning.