**Senior Design Capstone Design Projects – Spring 2023**

**Reporting Guidelines**

The following guidelines are provided to ensure that each design group progresses toward its project deliverable using project management techniques currently used in industry. Faculty will meet with each group every two weeks to review progress and discuss solutions to project bottlenecks.

1. Design project file. The electronic design file should be maintained in Box or on an open-source repository such as GitHub. Your project should be organized with separate folders as follows:

* Introduction explaining the need for the device and the project deliverables.
* Statement of Work (SOW). Format described in more detail below. The SOW should be updated prior to each project meeting. The SOW can be revised as needed as the project progresses.
* Major Tasks: Each major task should have a folder that is updated for each project meeting. This folder should include a document describing the current status of the major task, the key accomplishments toward completing the sub-tasks, the remaining sub-tasks to be addressed, and future plans. Supporting documents, such as CAD files, parts lists, and data should also be uploaded to the folder for each major task.
* Presentations: The slides for each project review meeting should be uploaded.
* Economic analysis, including the budget for the prototype, payback period, net present value, etc.
* References

2. Progress Update Oral Presentations (1 Fall Semester, 5 Spring Semester). Presentation slides should be uploaded to the project file by 9:00am the day of your scheduled progress update presentation.

3. Final Design Report. The final design report will be due at the end of the S23 semester and should follow the format in SSLW, 4th Edition, Chapter 23 but can be modified, as needed, to fit your specific design team project.

4. ChBE Chemical Innovation Symposium: Present an electronic poster and your final prototype.

5. Senior Design Day: Present a printed poster and your final prototype.

**Recommended Strategies for Assembling a Statement of Work (SOW)**

The SOW is used to assess progress in completion of the scope of the work outlined in the proposal. It serves as the synopsis of the entire project. The SOW should provide sufficient detail that upon reading, an individual unfamiliar with the project can have a general understanding of the intent and approaches without referring to the proposal.

Please consider the points below and include the following information (where applicable) when drafting your SOW:

1. Date your SOW according to when it was written/submitted/last edited.
2. List each major task and subtasks. Please use 1-2 concise statements to summarize the tasks that must be performed in the SOW. There does not need to be a lot of detail, just the goal of the task/subtask and then general types of work that will be used to achieve that goal.
3. List each milestone that will be completed. One or more sub-tasks may contribute to a milestone.
4. Next to each task/subtask, use the initials of the relevant key personnel to indicate who will perform the task/subtask.
5. Provide a cohesive timeline that covers the entire period of performance and indicates the months each task is expected to be performed. For example, Major Task 1 to occur in Months 1-3, Major Task 2 to occur in Months 2-6.
6. Define all abbreviations upon first use or include an abbreviation list at the end of the SOW.

**Recycled PET Extruder**

**STATEMENT OF WORK – 3/05/2023**

**PROPOSED START DATE – 01/09/2023**

|  | **Timeline (months)** | **Personnel** |
| --- | --- | --- |
| **Preliminary Material Testing** | 1 |  |
| Subtask 1.1: Secure PET regrind source, by working with the VU Recycling Center. If this does not work, plastic bottles will be collected personally. | 1 | BC |
| Subtask 1.2: Determine method to shred plastic bottles and granulate the shreds into flakes (regrind). | 1 | BC, MM, AP |
| *Milestone # 1.1* ***Regrind is ready for testing.*** | 1 | BC, SL, MM, AP |
| Subtask 1.3: We will test the Filabot EX2 Extruder in the Digital Fabrication Lab with Filabot PETG pellets. | 1 | BC, SL, MM, AP |
| Subtask 1.4: Make scrap filament with the Filabot EX2 Extruder in the Digital Fabrication Lab with regrind flakes. | 1 | BC, SL, MM, AP |
| Subtask 1.5: Pelletize scrap filament using pelletizer in the Digital Fabrication Lab. | 1 | BC, SL, MM, AP |
| Milestone # 1.2 ***rPET pellets made from plastic bottle regrind.*** | 2 | BC, SL, MM, AP |
| Subtask 1.4: Test PET regrind using DSC to determine thermal properties of regrind PET simulation. | 1 | BC, SL, MM, AP |
| *Milestone # 1.3* ***Validate regrind simulation results with literature simulation.*** | 1 | BC, SL |
| **Simulation and Design of Extruder** | 1.5 |  |
| Subtask 2.1: Model filament flow in NextruCAD to obtain key design dimensions, using literature values. | 1 | BC, SL |
|
| Subtask 2.2: Obtain a quote and order extruder screw from Filabot. | 0.5 | SL |
| ***Milestone 2.1: Extruder screw with custom dimensions is ordered and ready for assembly.*** | 1 | BC, SL |
| Subtask 2.3: Design the full filament extruder (screw, motor, housing, barrel, hopper, etc.) in Fusion 360. | 1 | SL,MM,AP |
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| Subtask 2.4: Obtain a quote and order barrel from machine shop. | 1 | BC,SL,MM,AP |
| Subtask 2.5: Obtain a quote and order housing from Send Cut Send. | 0.5 | MM,AP |
| Subtask 2.6: Order electronics, controllers, and motor from McMaster-Carr. | 0.5 | BC,SL |
| Subtask 2.7: Assemble extruder. | 1 | BC, SL, MM, AP |
| ***Milestone # 2.2 We will assemble our prototype extruder.*** | 1.5 | BC, SL, MM, AP |
| **Creating, Printing, and Testing Filament** | **2** |  |
| Subtask 3.1: Extrude filament from our regrind PET pellets and PETG pellets. | 1 | BC,SL,MM,AP |
| Subtask 3.2: Print 3D different shapes to assess printing abilities. | 1 | BC,SL,MM,AP |
| Subtask 3.3: Test material properties of the 3D printed parts. | 1 | BC,SL,MM,AP |
| ***Milestone # 3.1 Collect materials data.*** | 0.5 | BC,SL,MM,AP |



Abbreviations List