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| EE495/CME495 |
| Robotic Positioner Project Plan |
| Revision 2 |

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| Thomas Hu, Jordan Smith, Jason Wong  10-1-2019 |

Contents

[1 Purpose 2](#_Toc20734353)

[1.1 Document Identifier 2](#_Toc20734354)

[1.2 Applicable Documents 2](#_Toc20734355)

[1.3 Revision History 2](#_Toc20734356)

[2 Initial Project Plan 3](#_Toc20734357)

[2.1 Discussion 3](#_Toc20734358)

[2.2 Risks to Project Performance/Schedule 3](#_Toc20734359)

[2.3 Deliverables 4](#_Toc20734360)

[2.4 Milestones 4](#_Toc20734361)

[2.5 Work Breakdown Structure 4](#_Toc20734362)

[2.6 Gantt Chart 4](#_Toc20734363)

[3 Appendix A – Gantt Chart 8](#_Toc20734364)

[Table 3‑1 - Project Milestones 4](#_Toc20734365)

[Table 3‑2 – Work Breakdown Structure 5](#_Toc20734366)

# Purpose

The purpose of this document is to present the project plan for the EE495/CME495 capstone project which will be taken on by group #5.

## Document Identifier

This document is identified as:

**CD2 – EE495/CME495 Robotic Positioner Project Plan**

## Applicable Documents

Applicable documents include:

**CD1 – EE495/CME495 Robotic Positioner Problem Definition**

## Revision History

|  |  |
| --- | --- |
| **Revision** | **Changes** |
| 1 | Initial Revision |
| 2 | Edited the task numbers in Table 2‑2 – Work Breakdown Structure to be easier to read. |

# Initial Project Plan

## Discussion

The team consists of two electrical engineers and one computer engineer. Jordan’s study streams are Circuits and Power. Thomas’ streams are Digital Signal Processing (DSP) and Circuits. Jason’s streams are Digital Systems and Computer Software. Due to the focus areas of each team member, responsibilities will be split into the following roles:

**Jordan**: Hardware development (primary), controller development (secondary)

**Jason**: Software & controller development (primary), project management (secondary)

**Thomas**: Systems design (primary), project management (secondary)

## Risks to Project Performance/Schedule

A list of risks that may impact the quality of the final product or project schedule include:

* Equipment lead times - some components that will be used in the design may have long lead times because they aren’t mass-produced products.
  + This will be mitigated by ordering components immediately after a final design is chosen.
* Component reliability - there is a possibility that the components ordered will not be reliable due to being new products, or due to being specialty components which may not have been tested to the extent of a component meant for larger market.
  + This can be mitigated by ordering components from more experienced vendors in the market, as well as avoiding ordering products that were recently introduced to the market.
* Outsourcing production - Doepker Industries will be helping build parts of the rotational unit, primarily the head/tail frame. Poor communication of design may result in Doepker building parts which may not be suitable for the design that the team envisioned.
  + This will be mitigated by creating clear documentation that will communicate exactly what the team wants built by Doepker Industries, and by communicating with Doepker to prevent misunderstandings.
* Unit is operated in an unexpected environment - Doepker Industries has multiple factories where the unit will be operated. Each factory will have different operating conditions, with the most important factor to keep in mind when designing the unit being that the unit must be compatible with the electrical systems used at each factory.
  + The team will design the unit to be compatible with all of the sites that the client provides electrical specifications for.

## Deliverables

Listed below are the deliverables for this project.

* Bill of Materials (BOM)
* Schematic diagrams
* Circuit board layout
* Software (firmware)
* Factory Acceptance Test Procedures
* Factory Acceptance Test Results
* System design document
* User manual
* System Block diagram
* Final Report

## Milestones

Listed in Table 2‑1 are major project milestones and their expected completion dates:

|  |  |
| --- | --- |
| Table 2‑1 - Project Milestones | |
| **Milestone** | **Date** |
| Problem Definition/Project Plan | October 1, 2019 |
| System Requirements Specification | October 25, 2019 |
| System Design Document | December 5, 2019 |
| Begin Unit Production | December 6, 2019 |
| User Manual | December 26, 2019 |
| System Verification Plan | January 6, 2020 |
| Perform Factory Acceptance Testing | February 13, 2020 |
| Final Report | April 10, 2020 |

## Work Breakdown Structure

Attached below in Table 2‑2 is the work breakdown structure which details the team member responsible for each task in designing the system and how many hours are budgeted for each task:

## Gantt Chart

A Gantt chart is attached in Appendix A to show the general timeline of the project.

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| --- | --- | --- | --- | --- | --- | --- |
| Table 2‑2 – Work Breakdown Structure | | | | | | |
| Task Number | **Task Name** | **Assignee** | **Hours Budgeted** | **Task Start** | **Task Deadline** | **Predecessor** |
| 1 | **Create Problem Definition and Initial Project Plan** | Thomas | **10** | **Fri 9/20/19** | **Fri 10/1/19** |  |
| 1.1 | Create Problem Definition | Jason | 5 | Sun 9/22/19 | Wed 9/25/19 |  |
| 1.1.1 | Define Scope | Jason | 1 | Sun 9/22/19 | Tue 9/24/19 |  |
| 1.1.2 | Define Objectives/Constraints | Jason | 2 | Wed 9/25/19 | Wed 9/25/19 |  |
| 1.1.3 | Review Safety/Environmental Regulations | Jason | 2 | Tue 9/24/19 | Wed 9/25/19 |  |
| 1.2 | Create Project Plan | Thomas | 5 | Wed 9/25/19 | Fri 9/27/19 | 1.1 |
| 1.2.1 | Create Work Breakdown Structure | Thomas | 2 | Wed 9/25/19 | Fri 9/27/19 |  |
| 1.2.2 | Create Gantt Chart | Thomas | 2 | Wed 9/25/19 | Fri 9/27/19 |  |
| 1.2.3 | Perform Risk Analysis | Thomas | 1 | Wed 9/25/19 | Fri 9/27/19 |  |
| 2 | **Sign and Return Non-Disclosure Agreement to Client** | Jordan | **1** | **Fri 9/20/19** | **Wed 9/25/19** |  |
| 2.1 | Discuss Non-Disclosure Agreement with Supervisor | Jordan | 0.5 | Tue 9/24/19 | Tue 9/24/19 |  |
| 3 | **Meet with Supervisor** | Jordan | **7** | **Mon 9/23/19** | **Mon 3/23/20** |  |
| 4 | **Create Requirements Specification** | Thomas | **8** | **Fri 10/11/19** | **Fri 10/25/19** |  |
| 4.1 | Review Requirements with Client | Jordan | 2 | Thu 10/24/19 | Thu 10/24/19 |  |
| 5 | **Draft Detailed System Design Document** | Thomas | **30** | **Fri 11/1/19** | **Thu 12/5/19** | 4 |
| 5.1 | Perform System Design | Thomas | **8** | **Fri 11/1/19** | **Fri 11/15/19** |  |
| 5.1.1 | Create Block Diagram | Thomas | 2 | Mon 11/11/19 | Fri 11/15/19 |  |
| 5.2 | Perform Hardware Design | Jordan | **20** | **Fri 11/1/19** | **Fri 11/22/19** |  |
| 5.2.1 | Draft Design Schematics | Jordan | 10 | Fri 11/1/19 | Fri 11/15/19 |  |
| 5.2.2 | Spec System Components | Jordan | 10 | Fri 11/15/19 | Fri 11/22/19 |  |
| 6 | **Make/Perform Interim Project Presentation** | Jason | **20** | **Fri 11/1/19** | **Tue 11/26/19** |  |
| 6.1 | Make Interim Project Presentation | Jason | 18 | Fri 11/1/19 | Mon 11/25/19 |  |
| 6.2 | Present Interim Project Presentation | Jason | 2 | Tue 11/26/19 | Tue 11/26/19 | 6.1 |
| 7 | **Write Interim Project Report** | Thomas | **20** | **Fri 11/15/19** | **Thu 12/5/19** |  |
| 7.1 | Review Initial Project Plan | Thomas | 2 | Fri 11/15/19 | Fri 11/22/19 |  |
| 8 | **Acquire System Components** | Jordan | **6** | **Mon 11/25/19** | **Mon 11/25/19** | 5.2.2 |
| 9 | **Perform System Development** | Thomas | **60** | **Fri 12/6/19** | **Fri 1/10/20** | 5 |
| 9.1 | Develop Software | Jason | 25 | Fri 12/6/19 | Fri 12/27/19 |  |
| 9.2 | Build Hardware | Jordan | 20 | Fri 12/6/19 | Fri 12/27/19 |  |
| 9.3 | Perform System Integration | Thomas | 15 | Mon 12/30/19 | Fri 1/10/20 | 9.1, 9.2 |
| 10 | **Create System Verification Plan** | Thomas | **37.5** | **Fri 12/20/19** | **Mon 1/6/20** | 4 |
| 10.1 | Define Use Cases | Thomas | 10 | Fri 12/20/19 | Sun 12/22/19 |  |
| 10.2 | Define Test Cases | Thomas | 10 | Mon 12/23/19 | Fri 12/27/19 | 10.1 |
| 10.3 | Write Test Procedures | Thomas | **15** | **Wed 1/1/20** | **Fri 1/3/20** | 10.2 |
| 10.3.1 | Review Test Procedures with Client | Jordan | 2.5 | Wed 1/1/20 | Fri 1/3/20 |  |
| 11 | **Perform Acceptance Tests** | Thomas | **40** | **Mon 1/13/20** | **Thu 2/13/20** | 10 |
| 11.1 | Perform Integration Testing | Jason | 20 | Mon 1/13/20 | Tue 1/21/20 | 8, 9 |
| 11.2 | Review Integration Test Results with Customer | Jordan | 2.5 | Wed 1/22/20 | Wed 1/22/20 | 11.1 |
| 11.3 | Perform Factory Acceptance Tests with Client | Thomas | 7.5 | Mon 1/27/20 | Fri 1/31/20 | 11.2 |
| 11.4 | Write Factory Acceptance Report | Thomas | 10 | Mon 2/3/20 | Fri 2/7/20 | 11.3 |
| 12 | **Write User Manual** | Thomas | **30** | **Fri 12/6/19** | **Thu 12/26/19** | 5 |
| 13 | **Prepare Final Project Presentation and Demonstration** | Jason | **40** | **Mon 3/2/20** | **Fri 3/20/20** | 5, 11 |
| 13.1 | Make Final Project Presentation | Jason | 20 | Mon 3/2/20 | Tue 3/10/20 |  |
| 13.2 | Review Presentation with Client | Jordan | 1.5 | Wed 3/11/20 | Wed 3/11/20 | 13.1 |
| 13.3 | Present Final Project Presentation | Jason | 1 | Fri 3/20/20 | Fri 3/20/20 | 13.2 |
| 13.4 | Prepare Project Demonstration | Jordan | 15 | Mon 3/2/20 | Thu 3/19/20 |  |
| 13.5 | Demonstrate Project | Jordan | 2.5 | Fri 3/20/20 | Fri 3/20/20 | 13.3 |
| 14 | **Write Final Project Report** | Thomas | **60** | **Mon 3/2/20** | **Fri 4/10/20** | 11 |
| 14.1 | Review Report with Client | Jordan | 2 | Mon 3/30/20 | Tue 4/7/20 |  |

# Appendix A – Gantt Chart

See following the following page for an image of the project’s Gantt Chart. If desired, a Microsoft Project or PDF file of the Gantt Chart can be requested from the group (email [thomas.hu@usask.ca](mailto:thomas.hu@usask.ca) to request the file).

