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Team 520: Simulated Assembly Line and Processing Workstation

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# Chapter One: EML 4551C

# 1 Abstract

Tallahassee Community College (TCC) requires a simulated assembly line and process workstation to be used in their Advanced Manufacturing and Training Center as a Mechatronics certification tool. TCC needs their students to be able to evaluate and diagnose various Mechatronics challenges they may encounter in real world manufacturing situation. In this case, the manufacturing machine will detect size and material, and have the objects sorted into their corresponding bins. Another important requirement of this project is TCC’s educational need for the machine, which requires the team to design a system that simulates several modes of failures that the students will need to evaluate and fix, in both the hardware and software. The team will accomplish this by designing an assembly line system that focuses on modular integration, which means the systems’ components can be separated and recombined, offering a degree of flexibility for the system, allowing for errors to be intentionally placed in separate functions of the machine. The basic functions for the system are as follows: a plastic box is placed at the input end of the assembly line, the system then scans the box to determine the size (say small) and material (plastic), then sorts and transports the object into a bin that stores small, metal boxes. The instructor will then set a failure or multiple methods of failure and the students must then diagnose and fix the problem in the system. The need for manufacturing systems like the one required by TCC is widely available in multiple industries, including the food industry, the environment industry, and even the travel industry. In these industries, the discovery and removal of foreign materials is crucial to the success of the product, and even for the lives of the people who use the product.

# 2 Project Scope

Team 520’s project of Simulated Assembly Line and Processing Workstation will consist of creating a manufacturing system that has a modular system capable of detecting and sorting materials in a manufacturing setting for Tallahassee Community College (TCC). TCC will be using this system as an educational tool for their Advanced Manufacturing and Training Center, which requires the team to design a system that simulates several different modes of failures that the TCC students will need to evaluate and fix, with errors being in both the hardware and software and the system. The design must consist of a detection system and a sorting system to have the product reach its correct bin designation. Detection of foreign materials in products is commonly done in many industries including the food and travel industries, where it can be hazardous to have the wrong material, making this project useful in many different industries.

**2.1 Key Goals**

Some of the key goals of the project include:

* Build a simulated assembly line that detects material composition of a product
* Measures the size of the product
* Sort the product into bins
* Simulate various failure modes to be fixed by students

**2.2 Market**

Some of the markets the products will target are:

* The clothing industry
* The food and beverage industry
* The packaging industry
* Electronics manufacturing companies
* Travel industry (like airports)
* Schools (as an Engineering teaching tool)

**2.3**  **Assumptions**

Some of the assumptions made to simplify the project sandbox and the project timeline are:

* Tallahassee Community College will provide the group with a partially constructed manufacturing machine that will then be rebuilt using some provided parts from their Advanced Manufacturing Lab
* Custom components will be 3D printed for rapid prototyping in order to shorten the timeline of the project

**2.4 Stakeholders**

The stakeholders involved in this project are:

* Tallahassee Community College (TCC)
* The students of TCC that will use the machine as learning or another project piece
* Dr Dorr Campbell, the project adviser
* Dr Shayne McConomy, the professor
* FAMU-FSU College of Engineering

# 3 Code of Conduct

**3.1 Mission Statement**

The goal for team 520 is to ensure a positive and productive work and research environment that will yield ultimate success in the project. Each team member is committed to embracing integrity, professionalism, and respect while dedicating maximum effort towards the success of the project.

**3.2 Team Roles**

* David DiMaggio - Design Engineer

The duties of the Design Engineer include performing research in order to create new ideas for the project systems while collaborating heavily with the Test Engineer during assembly to produce the required system. They will also improve quality and efficiency of existing products to fit the customer requirements using CAD modeling software such as SolidWorks or Pro Creo to model the product before manufacturing for efficient assembly and testing.

* Cheyenne Laurel - Project Manager

The Project Manager is responsible for the overall progression of the project to meet deadlines as well as handle financial budgeting for the project. The Project Manager will be in charge of communication between the group’s sponsor and advisor throughout the project to ensure no member is out of touch. They will be responsible for setting all group meetings according to team needs as well as representing the team during events and presentations.

* Boluwatife Olabiran - Software Engineer

The Software Engineer will be creating the coding and programming necessary to integrate the electrical and mechanical parts of the assembly line. Using C and Python programming, the Program Engineer will be responsible for applying the necessary commands to the manufacturing machine.

* Nataajah Taylor - Hardware Engineer

The Hardware Engineer is responsible for assessing and assigning appropriate electrical and programmable parts for the project. Also working with the Program Engineer to ensure working software for the electrical components, and programmable parts.

* Joell Williams - Test Engineer

The Test Engineer will ensure the assuring parts and systems are up to the project qualifications. Responsibilities will also include working closely with Software Engineer, Hardware Engineer, and Design Engineer to relate any bugs or improvements within the production.

**3.3 Communication**

For Team 520, the main form of communication will text messaging in a group chat containing all group members. GroupMe will be used as a second option to texting to accommodate for all phone models. Email is the second primary form of communication used to send any important information regarding meeting times and locations, important sponsorship information, and file transfer. To ensure that each team member has access to all necessary files, each file will be uploaded to the group's Google Drive so there are no missing documents.

Each team member will need to reply to any messages from the Project Manager and other group members within 24 hours to confirm meeting times and locations. As well, each member will have to notify the rest of the group at least 24 hours in advance if they are unable to make the agreed upon meeting time, while also providing a new available time to meet. Failure to do so will be noted amongst other group members for final evaluations and may result in a larger workload for such member.

**3.4 Dress Code**

Team meetings and advisor meetings can be attended in casual attire that must be appropriate still. Sponsor meetings, group presentations, and other formal outings must be attended in business casual or formal attire, of which will be specified by the Project Manager at least 24 hours before the event.

**3.5 Ethics**

All team members are required to adhere to the NSPE Engineering Code of Ethics to ensure the safety of the team, the users, the public, and the employer.

**3.6 Attendance Policy**

Team members are expected to appear and participate in all meetings with the sponsor, advisor and instructor. Ideas, budgets, project progress, timelines, conflicts, due dates and submissions will be discussed. Absence is not acceptable unless prior notification is given with genuine reasons or due to unforeseen and emergency situations. If more than one unexcused absence occurs, Dr. McConomy will be contacted for guidance.

**3.7 Decision Making and Conflict Resolution**

 Any decisions or conflicts will be referred to the group majority process in order to determine the final decision or resolution.

1. The first step will require the problem or decision to be explained to the entire group while allowing questions to make sure all components or conflicts are understood by the team members.
2. The group will come to a resolution of three final choices or resolutions that are cohesively decided by all members of the group.
3. The final choices will be held to a group vote where the majority vote will decide the final resolution.

When deciding on other choices such as unassigned tasks, the group will deliberate to whoever feels most comfortable with the task at hand in order to handle it. If no volunteer comes forth, then the task will be assigned to the member whose project role most closely encompasses the task.

**3.8 Statement of Understanding**

By signing this document, each member of Team 520 acknowledges and agrees to the code of conduct set forth by the class and the group.

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