MRE 3014   **Term Project**   **Fall 2018**

Prof. Kerns, Jing, and Long   **Due Date: December 12, 2018**

Project Description:

The objective of the project is to design and build a fully automated robotic system that performs a pick-and-place operation. The specific task consists of identifying 2-inch triangular or square steel plate parts that are randomly placed on a white surface centered 12 inches away from the base of the robot, picking the parts, and moving them to two different stacks (one for squares, one for triangles) located on a white surface at a $90°$ angle from the original location and centered 12 inches from the robot base. While no restrictions or additional specifications are imposed on the automation system, design considerations should include such factors as cost, weight, size, manufacturability, maintenance, speed and accuracy of operation, robustness and durability.

Deliverables:

> - Midterm: The mechanical structure of robotic arm must be demonstrated during the lab session on Oct 17. All the other necessary hardware such as motors must be purchased and delivered.
> - A final working demonstration during the last lab session of the semester (December 12).
> - Full CAD models of the robot design.
> - Equations of motion of the robotic system.
> - Software Engineering Documentations
> - Source code
> - A PowerPoint presentation using the template supplied for the project.

PowerPoint Slide Deck Content:

Your PowerPoint presentation should include the sections below at a minimum. You are free to add any other sections or subsections if needed to your presentation. Use the provided rubric as a guide for the formatting A working prototype demonstration during the last lab session of the semester (December 12).

> - Project objective description
> - Literature review and market research
> - Designs considered (List all the different designs you considered and elaborate briefly on your final two or three choices)
> - Proposed design details
>   - Design overview
>   - Justification for the choice (cost, performance, manufacturability, durability, flexibility, …)
>   - Detailed description of the mechanical design process, calculations, and graphical and visual aids
>   - Description of the actuation/sensing schemes and robot programing
> - Budget
> - Summary of the prototype test results
> - Lessons learned
> - Recommendations for future development and conclusions

Triangle
Stack

Robot Arm
Base

Square
Stack

90°

90°

17,15

12"

8 ½ "

11"

16,25

20"

Shapes randomly
placed on the surface.

>3.75

8+x

15"

3,75+x