**MEGN 481 Machine Design – Fall 2016**

LAB 1: Motion Base and Cabin Floor Platform structural design and analysis

The first portion of your project consists of design and structural analysis of the Motion Base, Cabin Floor Platform, and the base-building interfaces.

Specifically, you must:

1. Create a conceptual design of the Motion Base and Cabin Floor Platform assembly based upon the clients’ criteria (provided). NOTE that the sketches of the design (idea) provided in the Technical Specification Document WILL NOT WORK.
2. Create an engineering design of the Motion Base and Cabin Floor Platform assembly to include material selection, assembly and installation considerations (if necessary), and connection details (if necessary). Your Motion Base/Floor Platform will likely need to have both bolted and welded connections. If welded, do not concern yourself with weld considerations at this point. Simply assume that the individual components are perfectly joined. If you are creating bolted assemblies, do not concern yourself with bolted considerations at this point. Simply assume that the individual components are perfectly joined. Keep in mind that your facility is NOT co-located with the final installation building. Additionally, all components will need to be shipped and installed into an existing building.
3. Perform a static analysis on your chosen engineering design per the specifications required in the Technical Specifications document
4. Provide all safety factors of interest, and support this choice of safety factor.
5. Perform analysis on the loading of the assembly to the base building.
6. Create a drawing package for construction,
7. Create a full engineering design deliverable per the provided example.

When performing this analysis you may assume:

1. The remaining components that make up the Motion simulator (items e through r, page 12/38 in the Technical Specifications Doc) will weigh 18,000 pound force and will load the Floor Platform along an equally-distributed line-load about the Floor Platforms perimeter.
2. The base building is to support no more than 32,500 pound-force. In which case the entire motion simulator (minus people) must weigh less than 25,000 pound-force.
3. Any material may be used for you design, but you must justify your choice.
4. For a future deliverable you will be performing a dynamic analysis of the system. For this deliverable you must chose a single snapshot in time in which the simulator is aligned at its worst-case loading situation and apply the required Failure Mode Effects Analysis

Some criteria and helpful hints are provided below:

1. You will not be performing design and analysis of the motion system (Drive Mechanism) at this point. However, the motion system will likely load the facility structure. As such, you must make some assumptions as to the structure loading analysis AND have an idea of a path forward for a Drive Mechanism. Ideally, these components (Baseplate, Gimbal, Drive Mechanism) cannot be decoupled. Time constraints require design decoupling for this course.
2. There is a logical order in which the design should proceed in this lab. Take some time to map out your path forward before you begin.
3. You must model using solid geometries in SWS. DO NOT use weldments, beam elements, or truss elements.

Specific systems to be designed and analyzed include:

1. Motion base (Baseplate and Gimbal only in the first lab) and platform-
   1. You must come up with three potential designs. You must choose your final design based upon a decision matrix.
   2. Structural design per applicable boundary and initial conditions (shipping?, assembly?, installation?, manufacturing?, etc.)
   3. Static analysis of the structure(s) per initial and boundary conditions provided.
2. Motion simulator to building interface
   1. Provide detail and support calc’s of the provisions to ensure facility loading is acceptable

A full engineering report must be submitted for this lab. The report must include everything provided in the example engineering report and follow the document titled “MEGN 481 Lab supplemental information.”

You may not use A-36 steel anywhere in this lab.