

UNC Charlotte – Lee College of Engineering Senior Design Program Company Information

Company Name	The William States Lee College of Engineering	Date Submitted	06/16/2021
Project Title	Design and fabrication of a hand-held, extendable, mechanical manipulator. (“Go Go Gadget Arm” or “G ³ Arm”) (UNCC_COE_G3ARM)	Planned Starting Semester	Fall 21

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

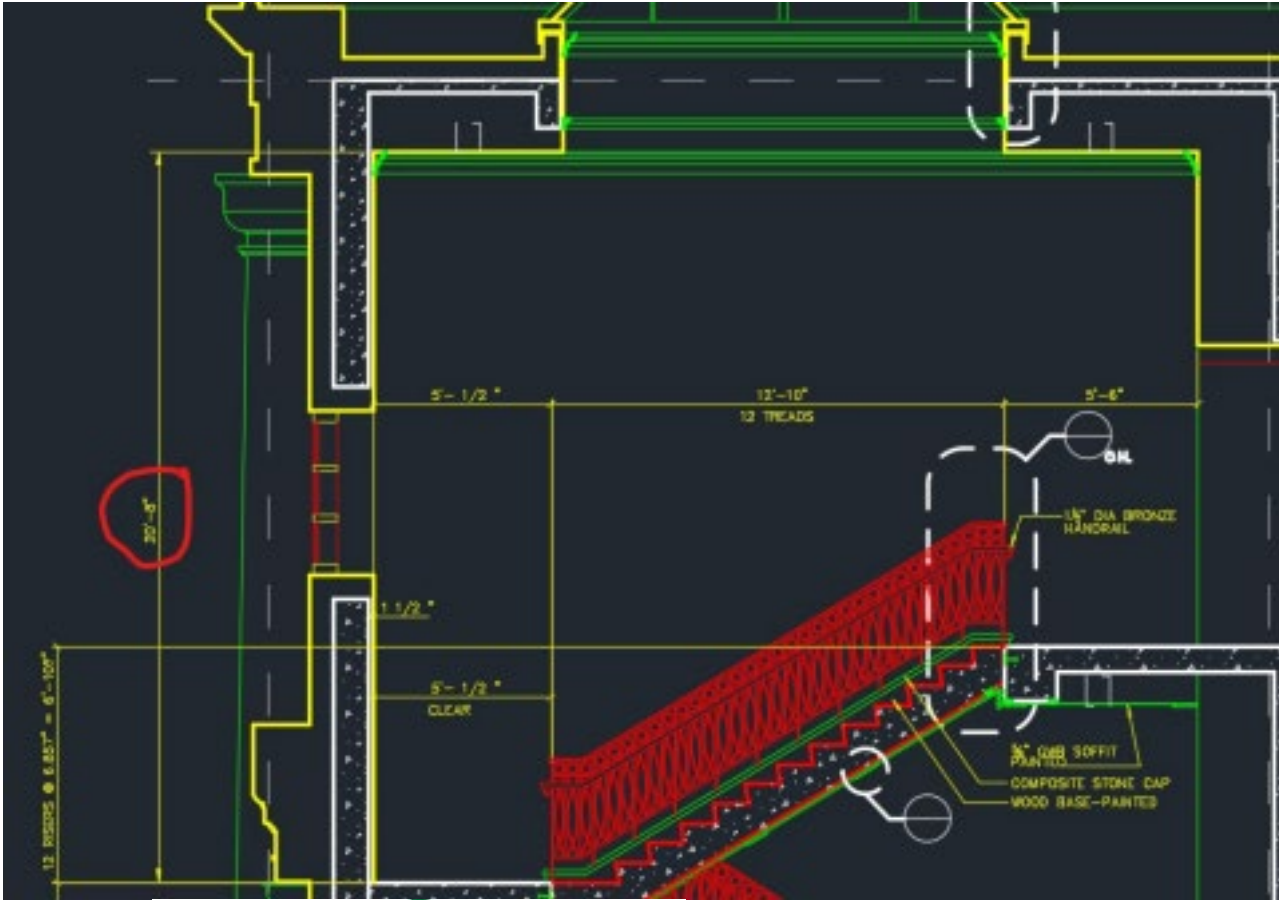
Discipline	Number	Discipline	Number

Mechanical (or MET)	5	Electrical	-
Computer	-	Systems	-
Other ()	-		

Project Overview and Requirements:

Go into Duke Centennial Hall. Go to the stairway on the Grigg-side of the building. Go to the landing between the 2nd and 3rd floors. Look up. There are light bulbs in the ceiling that are original to the building from 2007 and they have been burned out for many years. This stairwell is a fire escape enclosure, and lighting is required per the fire code. The reason they’ve never been

changed is because no one can reach them (short of constructing scaffolding in the stairway). If you look closely, the light fixtures are designed in such a way that the light bulbs screw in *from the side*. Meaning, they can't simply be unscrewed from below with a straight pole.



Additionally, falls from height are the leading cause of workplace deaths according to OSHA. It is safer to bring the work to you, rather than going up to the work.

“Successful” criteria:

- An extendable device no greater than 6ft (1.8m) long when fully retracted and 20ft (6m) long when fully extended.
 - Device must be able to be locked at any length between fully retracted and fully extended.

- All functions of device must work regardless of length.
 - Device must function in any orientation: overhead, under-reach, or horizontal. •
- The working end of the device has two main mechanical features:
- A grabber mechanism with variable pressure such that the operator can tell how much pressure is being applied to the object being manipulated (you don't want to shatter a light bulb in the ceiling, but you also need to firmly hold onto things)
 - A wrist-like joint to allow the grabber mechanism to be oriented independently of the extendable portion of the device.
- Weigh no more than 20lbs (9kg)
 - Be able to hold and support a 5lb (2.25kg) weight from the “grabber” in any orientation.

Expected Deliverables/Results:

Deliverables include:

- Complete design package including:
 - General arrangement drawings (assembly drawings)
 - Detail component drawings (fabrication drawings)
 - “Installation, Operation, and Maintenance” (IOM) manual (how to use, how to fix, repair parts list, etc)
- Working prototype meeting the above criteria
- Successfully change the lightbulbs in the Duke stairwell.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- none