

## UNC Charlotte – Lee College of Engineering Senior Design Program

### Senior Design Project Description

<b>Company Name</b>	<i>GKN ePowertrain</i>	<b>Date Submitted</b>	3/21/2019
<b>Project Title</b>	<i>Assembly Training Station</i> <b>GKN_TRAIN</b>	<b>Planned Starting Semester</b>	Fall 2019

#### Personnel

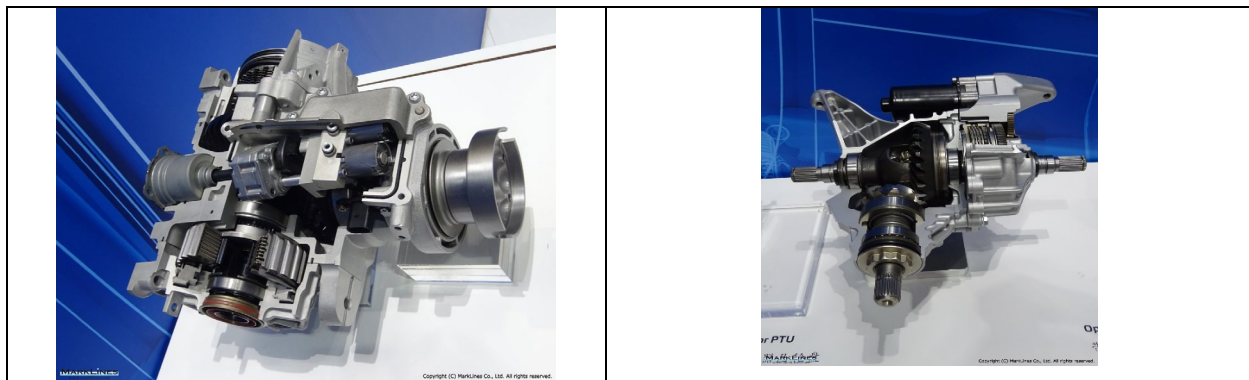
Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

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

<b>Discipline</b>	<b>Number</b>	<b>Discipline</b>	<b>Number</b>
Mechanical	3	Electrical	2
Computer	1	Systems	
Other ( )			

#### Company and Project Overview:

GKN ePowertrain, Newton is a leader in Tier 1 automotive differential assembly and component manufacturing. There are 2 plants on the Newton site. Plant 1 is the machining facility where differential ring and pinions are generated and manufactured. Plant 2 is the assembly plant. With 13 assembly lines and 4 major products it is a lean and diverse facility. The four main products that are manufactured are RDM (Rear Drive Module), FDU (Front Drive Unit), PTU (Power Transmission Unit), and Hydraulic disconnect clutches. With each of these units there are variants of clutch engagement and differential gear ratio, up to 18 variants per product, per customer. Some product examples:





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With the 13 assembly lines in the plant, training of assembly operators is a cumbersome process. Many of the new employees have never seen an assembly line or functioned in an assembly environment. GKN needs to bring improved exposure to the training process, so a simulated assembly station is needed to ensure new employees understand and can interact with the basic job requirements prior to starting work on the assembly line.

**Project Requirements:**

Examples of actual assembly stations are shown below:

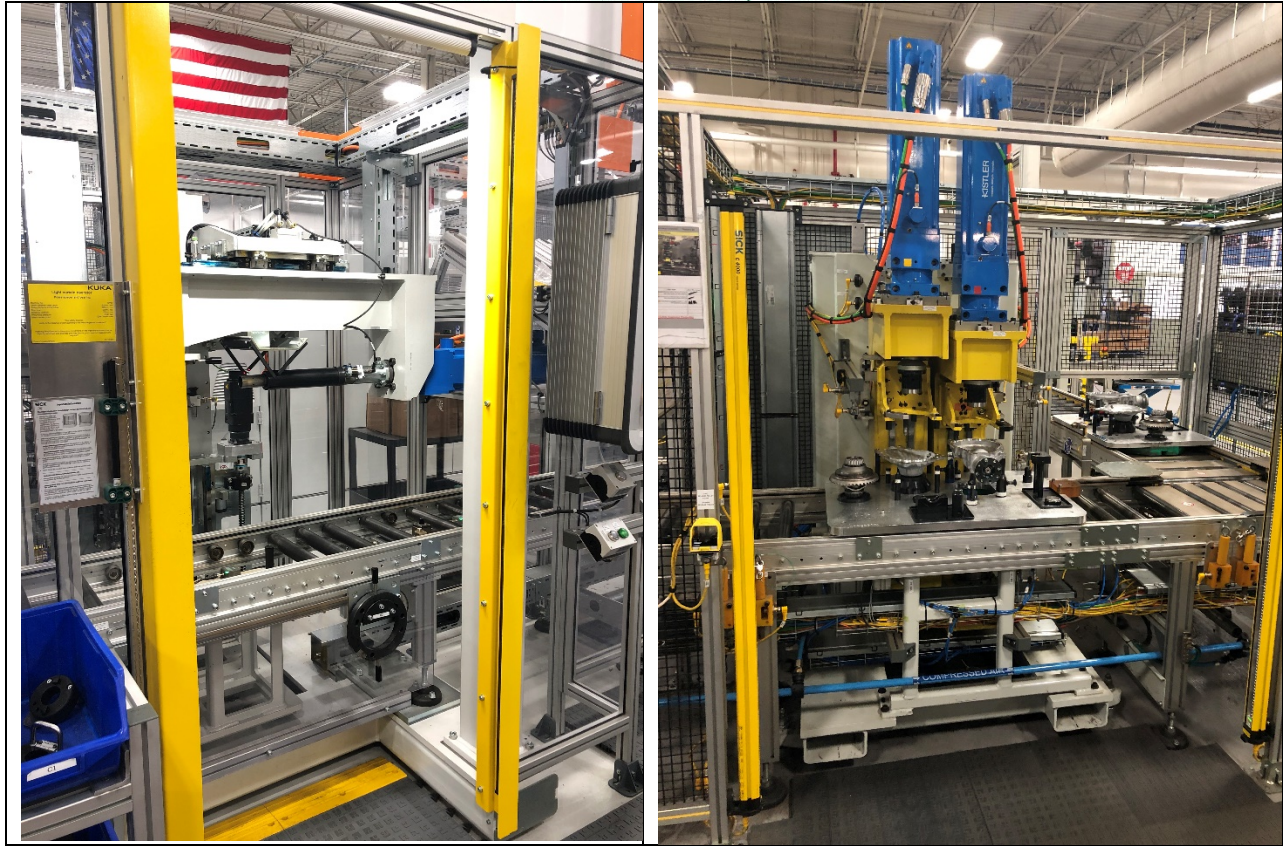






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The simulated assembly station will not replicate an actual specific assembly station, it will be a station that new trainees can use to get exposure to typical characteristics found in real assembly workstations. The design of the assembly training station will be open to the creativity of the Senior design engineering team. The expectation is that the team spends time on the production floor to understand the assembly lines and the assembly processes. From that, GKN would like the senior design team to make recommendations to what functions should be included in the training station based on what they see as issues the operator would face from an experience and ergonomic perspective. Design priorities are: Safety first, quality second, operations third. Working with the assumption that a new employee has never worked in an assembly plant before, what should they know before they received specialized training at their work station? As students are not experienced assembly operators, they should be in a good position to understand the mindset of a new trainee.

The senior design team should take the feedback from GKN and develop a timeline to ensure that the timing fits into the window of the senior design project. GKN will assist in streamlining as necessary with long lead time items and specialty components that may be necessary.

There are some fundamental features like the safety devices that must be included, they are as follows: Light curtain, palm buttons, stack light, and lockout devices. Based on the team survey of plant operations, additional features can be agreed upon. As the team creates the plan to build and purchase the necessary components for the training station they will also have to put together



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the required work instructions, by the GKN standard template, so that new employees will be able to have a reference on how to operate the station and understand the risks involved with the station step by step.

As the components arrive, the team will have to construct the training station at the UNC Charlotte lab facilities. The students take total ownership and build the frame from the ground up considering mechanical design elements and electrical/computer attributes. Building the controls around the safety system to ensure no injury or accidents can occur is the key. With the support of the GKN, the expectation is a fully functional station that can be used to train and demonstrate the requirements of an operator in a controlled environment.

### **Expected Deliverables/Results:**

- Functional assembly training station
- Design and build of the station
- Full Electrical and Mechanical print pack
- Complete parts list
- Electrically controlled station, if pneumatics is required they must be stand alone with a included compressor
- Safety controller integrated into the Siemens PLC system
- Including critical components from the assembly plant to ensure that new operators are comfortable and understand what they will be seeing and expected to utilize on a daily basis.
- Unit must be mobile, so it can be utilized in the GKN training center or on display at the facility.

### **Disposition of Deliverables at the End of the Project:**

GKN will support the senior design project by ensuring that the station is portable and can be maneuvered between the UNC Charlotte campus and the training center at GKN Newton. This is intended to be a learning tool, so it can be shared as necessary. Unit will be demonstrated at the Expo, then transferred to GKN.

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

Drafting / CAD work will be required

Electrical controls and electrical systems

Ergonomics and Safety

Fabrication and assembly