

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

### Senior Design Project Description

<b>Company Name</b>	<i>Schaeffler Group USA</i>	<b>Date Submitted</b>	<i>5/21/2019</i>
<b>Project Title</b>	<i>Design and Build of a Servo Press Module Assembly</i> <b>SG_SERVO</b>	<b>Planned Starting Semester</b>	<i>Fall 2019</i>

#### Personnel

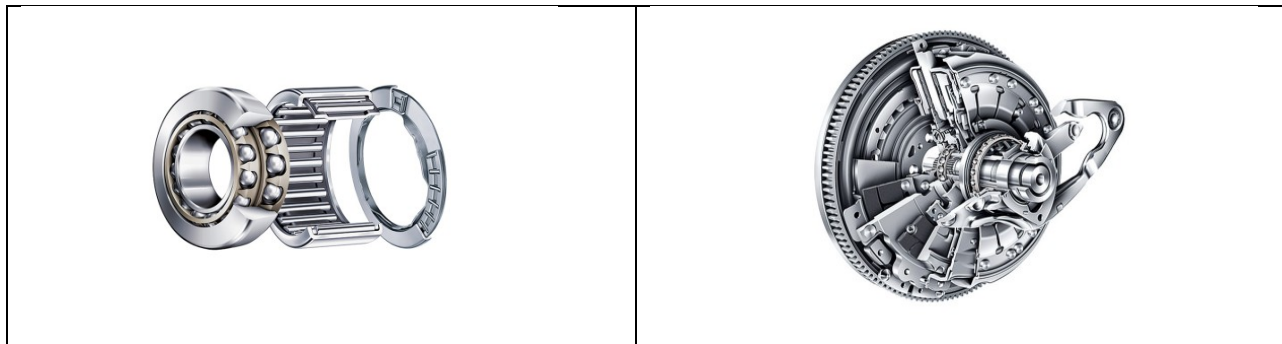
Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

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		Systems	
Other ( )			

#### Company and Project Overview:

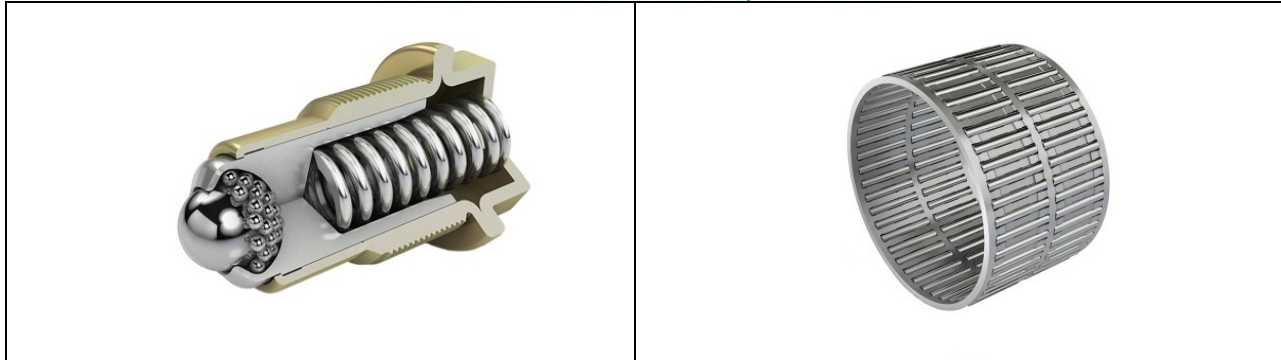
Schaeffler Group is a multinational corporation that supplies engineered components to the automotive and industrial sectors. Some notable customers of the Schaeffler Group are Ford, General Motors, Fiat Chrysler Automobiles, John Deere, and Harley Davidson. Components supplied by Schaeffler Group range from a simple ball bearings to Multiair, a hydraulically-actuated variable valve timing which is supplied to Fiat FIRE and the Chrysler Tigershark engines. See some product examples below:





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The Fort Mill Prototype Dept. supports all prototyping activities for the North America Region. The department has very specialized equipment and personnel to support development and production activities. UNC Charlotte students will support with integrating all necessary equipment to create an operational servo press module for the Fort Mill Prototype Department

### **Project Requirements:**

For this project, UNC Charlotte students will act have the opportunity to design and build a servo press module for the prototype department to use for assembly operations at Schaeffler. A servo press is a mechanical press (frame and ram) that is driven by a servo motor. The servo motor allows for flexible control of the press operation (highly programmable). Technical skills required for this project are, but not limited to: CAD design, FEA, wiring, wire diagrams, PLC programing, HMI programing, technical writing, safety integration, process understanding, print reading, manufacturing principles, communication, and assembly methods. During the project, the students will have access to our local manufacturing plants for idea generation and benchmarking. During the idea generation phase, the students will have the opportunity to see manufacturing of the rocker arm supplied to the Ford Mustang and a ball bearing assembly for Rivian (electric truck company backed by Amazon). Additionally, the students will receive support from Prototype Tool Design and Engineering. They will be available to provide guidance / support when questions arise.

Schaeffler will provide the team with the servo press module (16 kN) from Festo, a PLC from Festo and a HMI from Festo. The team will be responsible to integrate the components provided and supply a working module. The students will need to select the correct sensors, design the fixtures / mounts for all the components, tooling to accomplish the list of part types below and finally but most importantly ensure the safe operation of the press.

The types of components from most important to least that need to be processed on the module are:

1. Ball Bearing assembly (horizontal)
2. Rocker Arm Assembly (horizontal)
3. Strut Bearing Inspection (vertical)
4. Staking / Pressing Components (tool specific, vertical)
5. Thrust Bearing underload spin and height (vertical)
6. Variable Cam Timing Under Load Inspection (vertical)



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Schaeffler will provide a detailed requirement specification with drawings, parts, requirements at the start of the project.

**Expected Deliverables/Results:**

- Working Servo Press Module
- CAD models of all components
- BOM of all components
- Wire Diagram for the electric circuit
- Programs for Festo PLC and HMI
- Work instructions on how to run and setup the module
- Tool design guide for all necessary part types
- Run-off to prove machine capability

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

The final machine will be picked up after the 2<sup>nd</sup> semester Expo by Schaeffler.

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

- CAD design
- PLC & HMI programming
- Technical writing
- Safety equipment and circuit selection
- FEA
- Ergonomics understanding
- Quality understanding