

## Senior Design Project Description

<b>Company Name</b>	<i>Caterpillar Corporation</i>	<b>Date Submitted</b>	<i>12/1/2020</i>
<b>Project Title</b>	<i>Pitch and Roll Indication and Display for a Small Wheel Loader (CAT WHEEL)</i>	<b>Planned Starting Semester</b>	Spring 2021

### 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	2	Electrical	2
Computer	1	Systems	
Other ( )			

### Company and Project Overview:

Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives. We are a leader and proudly have the largest global presence in the industries we serve. For more than 90 years, Caterpillar Inc. has been making sustainable progress possible and driving positive change on every continent. Customers turn to Caterpillar to help them develop infrastructure, energy and natural resource assets. With 2017 sales and revenues of \$45.462 billion, Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives.



This project will be with the Clayton (NC) Machine Development Center (CMDC), where more than 200 engineers, prototype technicians and expert operators work to design, build and test machines in one location. The CMDC has dedicated 150 acres for machine development and

features a half-mile, high-speed machine track, 10 test and demonstration areas and seven machine operation areas to prove machine reliability and durability. The Clayton facility manufactures small wheel loaders and serves as a product distribution center for backhoe loaders. This project will be associated with a particular front end loader model.

**Project Requirements:**

The Cat 938M Small Wheel Loader sets the standard for productivity, fuel efficiency and operator comfort. See the photo below:



We would like the team to investigate a method / means for ascertaining the pitch (for/aft axis) and roll (about machine center line) of the machine, relative to ground position. With the machine working on undulating terrain and having an oscillating rear axle, determining the position of the front frame/axle centerline relative to the rear frame/axle centerline and ground, in real time, and then displaying this information simply and understandably for an operator, is the objective of this project.

Student team will research a solution of how this could be done for the 938M. Durability and cost are key components in a successful design, with an ideal production cost for the entire system (sensors, harnesses (if req'd) and mounting hardware) being <\$100 for an estimated annual usage of 500 machines.

**Expected Deliverables/Results:**

- Fully documented design, including drawings, component specifications, etc...
  - To include sensor type/classification to be used
  - Specify mounting locations on the machine (including guarding if needed), including drawings of proposed mounts



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- Any additional harnesses/equipment required for machine
- Testing and verification of the design to validate performance
- Prototype of the new design

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

Provide prototype to the industry supporter at the conclusion of the Expo.

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

- Interest in sensor technology, displays, rugged applications