**Name of Project:** Next Generation Engine Technology Implementation

**Abstract:**
Students on this team will conduct studies on existing and future engine technologies with ISUZU mentors to implement those in ISUZU’s model based development process. Students would develop mathematical and 1D models for ISUZU’s next generation engines and engine subsystems.

**Impact:**
This project is the beginning of the new era of the design optimization using model based approach at Isuzu. The goal is to develop the capability here at Isuzu to have a solid platform for the model based development to perform the model implementation, design optimization and development of the new products for the customer. This methodology will also be used in the sub-system development program for yearly upgrades on our current engines line up to meet customer demands and also the emission regulations.

**Scope**

**Include a Deliverable (Phase I) and Details Here: BASELINE GOAL**

Students would perform testing data analysis for model development and technology evaluation. Phase I should deliver mathematical models for engine performance evaluation including engine friction, knock and misfire estimation along with literature review summaries. Fuel economy improvement technologies like engine start-stop would also be evaluated in this stage. The success will be decided on the students’ effort and model or simulation accuracy.

**Include a Deliverable (Intermediate – Phase II) and Details Here: SUCCESS**

Study the feasibility to implement mathematical models in GT-Suite or utilize GT-Suite’s capability to predict engine and its subsystems’ performances. Additional analysis would be performed both in 1D and 3D. Students need to deliver integrated subsystem models with ISUZU’s models. The success will be decided based on model integration and model accuracy.

**Include Stretch Goals and Details here: HIGH SUCCESS**

Perform design analysis and optimization in 1D and 3D analysis.

**Student Skills**

<table>
<thead>
<tr>
<th>Project Roles</th>
<th>Key Skills and/or Knowledge</th>
<th>Likely Majors</th>
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</thead>
<tbody>
<tr>
<td>Advanced Fluid Dynamics Modeling (3 students)</td>
<td>3D CFD simulation both combustion and fluid dynamics.</td>
<td>ME, MICDE, ISD-Auto, ChE, AERO, Physics</td>
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<tr>
<td>Internal Combustion Engines (2 students)</td>
<td>Bring a detailed understanding of internal combustion engines to support the team model development. ME 438 combustion engines (or equivalent).</td>
<td>ME, ISD-AUTO, ISD-GAME</td>
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</tbody>
</table>
Model & Simulation Development (2 students) | 1D and 3D simulation model development Design and Model Optimization | EECS, Math, ME

Additional:
Ideally will be familiar with the overall gasoline SI and diesel CI engine mechanical systems. Students with mechanical or automotive backgrounds and who have taken ME438/ME 555/ME 569 will be preferred.

Training will be provided in GTSuite and Converge. Transportation to Isuzu Technical park in Plymouth provided by MDP.

Location:
Most project work will take place on campus during the semesters. There will be frequent trips to the Isuzu technical park in nearby Plymouth, MI for collaborative work with Isuzu Engineers.

Sponsor Mentors

Lakshmidhar Uppalapati, Model Based Development Engineer II
I focus on 1D Phenomenological models development and application. I graduated from Michigan Technological University in 2015 and started working at ISUZU.

Saurabh Sharma, Model Based Development Engineer II
I am a Master’s graduate (2016) in Mechanical Engineering from University of Illinois at Chicago, focusing on the 3D CFD simulation based development at ISUZU.

Yifan Wei, Model Based Development Engineer I (C)
I focus on 1D simulation. I graduated from University of Michigan – Ann Arbor in 2018 and used to be a member of ISUZU MDP.

Additional Supporting Members

Yong Sun, Model Based Development Supervisor
I focus on CFD simulation. I am a Master’s graduate (2012) in Aerospace Engineering from the University of Michigan-Ann Arbor. Previously, I worked at Oak Ridge National Lab and Ricardo, Inc.

Faculty Mentor
Faculties with the expertise in the same field will be very helpful for this project.

Legal Requirements:
Citizenship Requirements (please select)
• This project is open to all students regardless of citizenship status
Intellectual Property Agreements / Non-Disclosure Agreement Requirements (please select)
• Students will sign the standard MDP IP/NDA agreement

Internship Information (please select)
• Interviews guaranteed for students interested in a summer 2019 internship

Company Information:
Isuzu is the global leader in commercial vehicles and diesel engines. We consistently focus on “creation without compromise” in the process of building and maintaining a world class organization. By expanding our operations across the globe, Isuzu products benefit people in over 100 countries. To ensure the most advanced performance and superb service, we are moving forward in product development, quality, manufacturing systems and customer support, which will become the new global standards of excellence. We hold an uncompromising commitment to improvement for better products and a better partnership with the world.