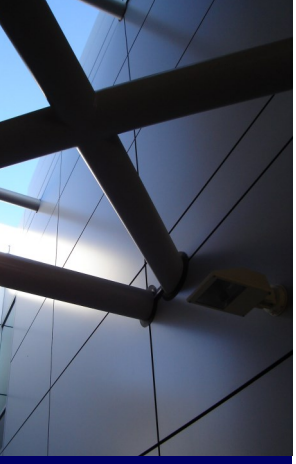

MECHANICAL ENGINEERING
DISSERTATION DEFENSE

The Department of Mechanical Engineering presents:

The Ph.D. Dissertation Defense of

Cavan McCaffery

Tuesday, March 16, 2021,
10am Pacific time

Impact of Emission Control Systems and Alternative Fuels on Off-Road and On-Road Internal Combustion Engine Emissions

Doctor of Philosophy, Graduate Program in Mechanical Engineering
University of California, Riverside, March 2021
Dr. Georgios Karavalakis, Dr. Heejung Jung, Chairpersons

Internal combustion engines (ICEs) represent one of the largest sources of air pollution in the United States, but emissions can be controlled. Emissions from ICEs contribute significantly to global warming and pose serious health and environmental concerns. Newer technology engines can increase efficiencies and emit less CO2, however, these same engines can have adverse effects increasing criteria pollutant formation. This dissertation is an investigation into the pollutant formation and mitigation from ICEs under a wide range of applications. The ICEs investigated in this study include small off-road diesel engines, light duty gasoline and diesel engines, heavy duty diesel and alternative fueled engines, as well as large marine engines and boilers.

Various emission control strategies and alternative fuels were investigated for their pollutant formation and mitigation properties. The control technologies evaluated include gasoline particulate filters (GPFs), selective catalytic reduction (SCR), and diesel particulate filters (DPFs). Alternative fuels evaluated include a second-generation biodiesel, hydrogenated vegetable oil (HVO), biodiesel HVO fuel blends, natural gas (NG), liquefied petroleum gas (LPG), diesel-electric hybrids, marine gas oil (MGO) and ultra-low sulfur heavy fuel oil (ULSHFO