



STUDENT PROJECTS

Day to Day Operations

- CDC SCBA
 - Data Collection
 - Data Entry and Computation
- PPE Interface Human Subjects
 - Physiological data collection and entry
 - Human Subject Logistics (water, supplies, setup, etc)
- Assistance with projects utilizing Firefighting Activity Simulator (FAS)
 - GORE/PSI exposure trials
 - Setup, data collection, packaging of samples

Small Scale Projects

- Roof Prop (Mark Clapp)
 - **Purpose: Design a training prop to simulate roof operations for firefighting programs.**
 - Improving training scenarios to replicate real-world conditions
 - Skills: Engineering Design
- 3D printed fire engine pump (Fire Apparatus Engineer program)
 - **Purpose: Simplify/scale CAD models for use as teaching tools**
 - Intro to fire service
 - Using CAD in fire-based applications
 - Skills: CAD (Creo preferred)
- Best Practices Curriculum Development
 - **Purpose: Develop Teaching Tools based on IFSI Research Data**
 - Skills: Education/Psych and Literature Review

Semester Long Projects

- SCBA Facepiece Study
 - **Purpose: Collaborating with UL FSRI to examine different facepiece designs (based on changes in NFPA standards) and their impact on thermal damage. Have advances in SCBA facepiece improved threshold to critical damage?**
 - Data Collection
 - Data Analysis
 - Report/Summary
 - Skills: Engineering or Physics Background
 - Thermal Dynamics
 - Failure Analysis
 - Programming (Raspberry Pi)
 - Data Collection and Analysis





STUDENT PROJECTS

Year Long Projects (or longer)

- MSA G1 Cosmed Integration
Purpose: modifying existing SCBA facepiece to allow collection of metabolic data while firefighters are on-air. MSA FireHawk masks are becoming obsolete
Master level
Update SCBA facepiece for integration with newer version of SCBA
Include validation of metabolic measurements
3D modeling of facepiece
Fluid dynamics analysis of flow through facepiece
Validation of VO₂ measurements (oxygen consumption)
Skills: CAD
Fluid Dynamics
Human Performance
Experimental Design
Computation (data acquisition and analysis)
- Tunable Diode Laser Absorption Spectroscopy (Prof Tonghun Lee)
Purpose: further the development of tools developed to measure water vapor and hydrogen cyanide in high-temperature fire environments
Master or PhD level
Build on platform developed by previous students in Prof Lee's Mechanical Science and Engineering Lab
Implement platform in fire environments at IFSI and in projects with UL Firefighter Safety Research Inst.
Skills: Mechanical Engineering
MATLAB/python programming
GitHub/data repositories
Data Computation
- **Other Notes**
Funding Mechanisms
REU
Grants
- **Possible pathways**
Reach out to RSOs - focus on large groups (Engineering Council, SWE, Soc Mech Eng, BioE)
- **Past Projects**
Modified SCBA facepiece for metabolic monitoring
Helmet for measurement of heat flux during firefighting operations
Tunable diode laser for measurement of HCN and water vapor
- **Future Projects**
Scale model of fire engine pump using CAD
Physiological Data Analysis - Self-Contained Breathing Apparatus of various weights



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