

## **Project Title: Energy Absorption Design with 3D Architected Structures**

3D architected solid structures present a new class of energy absorption materials that offer more flexibility in tailoring the response to various impulse loading conditions. Energy absorbing materials are of interest in protection from impact and rapid loading in applications ranging from helmets and safety equipment to car bumpers. The goal of most energy absorbing structures used in these applications is to undergo a large decrease in volume to extend the impulse time and in turn reduce the pressure experienced by the system. There have been growing constraints on the weight and volume of energy absorbing structures meaning that traditional solutions based on solid materials will not provide enough protection. To meet these demands the use of architected materials made of 3D lattice structures have shown promise in significantly increasing the energy absorbing properties of a system while being able to be designed/tailored for specific applications. The objective of this project is to investigate and develop different lattice structures and material designs for the purpose of maximizing the energy absorption capabilities of structures undergoing impact and high strain rate loading while minimizing the weight and volume.

### **Project Deliverables:**

For this project the student is expected to provide a final report containing literature review into existing energy absorbing lattice structures, design and analysis of alternative lattice structures with energy absorbing application, and potential prototype and testing. Design must include changes in relative density, type of cell and application-specific functional grading.