

The Department of Mechanical Engineering Presents

# Madelyn Madrigal Camacho

## Chia-Wei Liu

## Baurzhan Muminov

.....

**Student:** Madelyn Madrigal Camacho

**Title:** Ball-Milled CoCr + X (X=WC or SiC) Composite Powders for Additive Applications

**Abstract:** The field of metal additive manufacturing (MAM) faces several challenges including the development and production of new alloy systems and powder composite manufacturing methods. This study investigates the viability of ball milling and laser sintering for CoCr composites reinforced by WC or SiC dispersoids. The particle size, microstructure, and composition of the powders are compared with post sintered samples to probe the microstructural evolution during laser processing.

**Speaker:** Chia-Wei Liu

**Title:** Rapid and Effective Sample Preparation Strategy by Using Micro-Homogenizer

**Abstract:** Plant disease is the leading cause of crop loss worldwide and is economically significant. An efficient sample preparation for subsequent nucleic acid-based assays is critical since rapid detection of plant diseases is desired for people working on-site. Given the inaccessibility of the benchtop instruments, portable and integrated sensing device is of great importance applied in-field. Our research focuses on assessing the efficacy of the micro-homogenizer for plant sample maceration as it is the major component within the device. We use spectrometer and fluorometer to investigate DNA/RNA concentrations and purities based on the UV absorbances at 260 and 280 nm.

**Speaker:** Baurzhan Muminov

**Title:** "Noise Robust Reconstruction via Simple Neural Networks"

**Abstract:** A shallow, dense, "small brain" neural network carries low computational complexity and is immune to adversarial attacks. We introduce a topological phase transform with a lenslet-array for high-speed and low-light camera imaging using such a small brain. Our hybrid optical-digital approach exploits the compactness and edge detection of Fourier-transformed spiral-phase gradients, whose representation boosts the signal-to-noise ratio. Increasing gains are attained in the presence of noise. Once trained, the small brain reconstructs an object from intensity-only data, solving a general inverse mapping problem, in non-iterative fashion and without deep learning schemes, i.e. in one forward pass. With vortex Fourier encoding, we reconstruct objects with low light flux ( $10\mu\text{J}/\text{cm}^2$ ) at a rate of several thousand frames per second on a 15W central processing unit.

**JOIN US**

**FRIDAY, MAY 22, 2020**  
**11:00AM-11:50AM**