

# UNDERGRADUATE SUMMER RESEARCH PROGRAM PROPOSAL

- Project title:  
**Robotic End Effector Fastening Mechanisms for Autonomous Aircraft Manufacturing**
- Faculty advisor  
**Dave Kim**
- Project description  
Autonomous manufacturing is an emerging field in modern industrial production. This project focuses on investigating holding and fastening mechanisms to support the design of aircraft structure fastening robot end effectors. The undergraduate researcher will design and fabricate a functional prototype to automate the bolt insertion and collar fastening processes. Using this prototype, they will test various process variables on aircraft composite-aluminum structure joining to provide robot end-effector design solutions.
- Deliverables
  - Design a fastening bolt insertion/collar screwing test prototype
  - Construct the prototype using machining and/or 3D printing, which are available on campus.
  - Conduct fastening tests to record force, torque, and displacement data.
  - Inspect fastening quality.
  - Report the results.
- Time requirements
  - 1) 240 hours.
  - 2) Flexible Mon-Fri, 8am-5pm, May 16 thru Aug 5 (240 hours within this timeframe)
- Constraints  
None
- Required skills and knowledge  
Completion of MECH 309 (material testing) and MECH 310 (design and manufacturing) or machine shop experience
- Preferred qualifications
  - Excellent work ethic in a team environment (professional behavior, encompassing integrity, responsibility, quality, discipline, and teamwork)
  - Effective communication (the undergraduate researcher will work with graduate students and the advisor.)