

DEPARTMENT OF MECHANICAL AND MATERIALS ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCE

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2024

PROJECT TITLE: Process monitoring and control of electrochemical additive manufacturing

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Project Description

Electrochemical additive manufacturing (ECAM) is a patented technology being developed in the Micro and Nanomanufacturing Laboratory at the University of Cincinnati. ECAM uses localized electrochemical deposition to fabricate alloy parts of complex shapes and composition distributions.

Project Scope:

The undergraduate student will get an opportunity to work in our research team and assist with designing a control system to deposit advanced alloy parts of complex 3D shapes. The scope of the design work is expected to include software (algorithms, mathematical operations, etc) and hardware (electrode fixturing, circuits, etc.) as necessary in order to achieve the desired system behavior.

Learning opportunities for student:

Participating in this project will expose the undergraduate student to hands-on, interdisciplinary research. Students will have the opportunity to build rare and valuable skills in studying physical phenomena from first-principles, experimentation characterization methods, analog hardware design, and/or modeling of the process at the atomic scale. Fundamental research skills will be covered including literature review, presentation, and report writing. The undergraduate student will also be encouraged to begin building a professional body of research work by presenting the work at either a conference and/or preparing a paper for journal publication.

Students will gain exposure to:

- Providing new knowledge on an emerging manufacturing technique
- Conducting a literature review
- Hands-on experiments with an electrochemical setup and hardware
- Coding of tool path planning algorithms and microprocessor control operations
- Problem solving and design work, involving software and/or hardware

- An excellent opportunity to exercise your initiative, creativity, critical thinking, scientific judgment, scientific knowledge, problem solving, and teamwork skills