Undergraduate Researchers – Manufacturing and Materials

The Materials and Manufacturing Group at the Applied Research Institute (ARI) at the College of Engineering University of Illinois at Urbana-Champaign (UIUC) is seeking up to 4 undergraduate researchers for this summer. The researchers would work with Dr. Dan Krogstad on one of several projects focusing on the development of new polymer materials including the 3D printing of epoxy nanocomposites, 3D printing of multimaterial actuators, bioinspired polymer composites and corrosion protective coatings. Another position focuses on the development of software to control the 3D printing paths of multiple materials. The positions would be for 40 hours a week for the summer. It is possible that the positions could be extended into the academic year at ~10 hours per week.

ARI’s mission is to provide rapid, cost-effective solutions for industry and federal clients. From the beginning, our vision has been to create a new model for a university-based laboratory. With a sharp focus on maturation and validation of technologies before they leave the laboratory, ARI currently focuses on three primary thrust areas: Materials and Manufacturing, Information Systems and Processing, and Indoor Climate Research and Training. More information is available at http://www.appliedresearch.illinois.edu/.

**Position 1: 3D printing of ordered nanocomposites**

**Job Duties and Responsibilities**

- Prepare block copolymer containing epoxy resins for 3D printing in order to determine the effects of the composition on the materials structure and properties
- Functionalize nanoparticles to incorporate them into the block copolymer domains
- Perform polymers characterization on the materials which may include rheological testing of the resins, DMA, DSC, SEM, DLS and/or SAXS.
- Effectively work in a team environment to solve research challenges

**Preferred Qualifications**

- Undergraduate student in materials science, mechanical engineering, chemical engineering, chemistry or related engineering disciplines
- Basic understanding of polymer chemistry and materials properties
- Experience with polymers characterization equipment such as DMA, rheometer, DSC, SEM, DLS and/or SAXS.

**Position 2: 3D printing of multi-materials**

**Job Duties and Responsibilities**

- Develop methods to 3D print samples using both FDM and direct ink writing within the same layer
- Optimize resins for direct ink writing
- Perform polymers characterization on the inks and the printed materials which may include rheological testing of the resins and mechanical tensile testing of the printed samples.
- Effectively work in a team environment to solve research challenges

**Preferred Qualifications**

- Undergraduate student in materials science, mechanical engineering, chemical engineering, aerospace engineering or related engineering disciplines
- Background using CAD programs such as AutoDesk Fusion 360
- Experimental research experience in polymer 3D printing
- Experience with polymer characterization equipment such as DMA, rheometer and/or tensile testing
**Position 3: Software for multimaterial 3D printing**

**Job Duties and Responsibilities**
- Develop and write new software to efficiently generate G-code from STL files with controllable path directions for a variety of geometries
- Develop methods and software to print with multiple materials within the layers
- Effectively work in a team environment to solve research challenges

**Preferred Qualifications**
- Undergraduate student in computer science, computer engineering, math, mechanical engineering or related engineering disciplines
- Experience developing software in C, C++, Python or Matlab
- Experience with 3D printing and G-code

**Position 4: Bioinspired polymer composites**

**Job Duties and Responsibilities**
- Prepare spherical epoxy particles with polymer coatings
- Study the effects of particle and coating dimensions on the mechanical properties of the hot pressed composites
- Perform characterization on the materials which may include SEM and/or mechanical testing
- Effectively work in a team environment to solve research challenges

**Preferred Qualifications**
- Undergraduate student in materials science, mechanical engineering, aerospace engineering, chemical engineering, chemistry or related engineering disciplines
- Basic understanding of polymer chemistry and mechanical properties
- Experience with polymer characterization equipment such as SEM and mechanical testing

**Position 5: Coatings for corrosion protection**

**Job Duties and Responsibilities**
- Prepare and paint metal samples with protective coatings
- Study the effects of the composition and processing on the coating protective properties
- Perform characterization on the materials which may include SEM, cyclic corrosion testing, and/or adhesion testing
- Effectively work in a team environment to solve research challenges

**Preferred Qualifications**
- Undergraduate student in materials science or related engineering disciplines
- Basic understanding of polymers and/or metal corrosion
- Experience with materials characterization equipment such as SEM

To apply for these positions, send your CV to Dr. Dan Krogstad at dkrogsta@illinois.edu.