

The NC Space Grant/Lord Corporation Summer Internship Program - 2008

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The NC Space Grant has partnered with The Lord Corporation to establish a summer internship program to give students real-world experiences in a cutting-edge industrial setting.

Lord Corporation is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. Operating from world headquarters in Cary, NC, Lord Corporation has 17 manufacturing facilities in nine countries and 90 strategically located sales and support centers worldwide.

The NC Space Grant/Lord Corporation Summer Internship Program will provide support for up to 4 undergraduate or graduate students (pursuing degrees in STEM disciplines) to participate in a 10-week internship at Lord Corporation's world headquarters campus in Cary.

Research Projects

Selected students will be assigned to a research project that best fits their educational experience. Each project will offer the student the opportunity to engage in hands-on research under the supervision of a professional mentor. NC Space Grant/Lord Corporation Summer Internship Program projects are described below:

- 1) **Rheology of Magnetorheological Fluids:** The goal of this study is to identify and quantify key magnetorheological (MR) fluid and device parameters that have the greatest impact on performance. MR fluid drastically changes its apparent viscosity in the presence of a magnetic field. Several rheological tools will be used to characterize the behavior of MR fluids, including a purpose-built high shear-rate capillary rheometer. The applicant will use the experimental data to extract fluid characteristics such as viscosity and yield stress.
- 2) **Reliable Vehicle Suspensions:** Magnetorheological (MR) fluid drastically changes its apparent viscosity in the presence of a magnetic field. When MR fluid is used in a shock absorber and an electromagnet is included in the piston, the damping force can be controlled in real-time to optimize vehicle ride and handling. The US military is very interested in MR controllable suspensions to increase the speed and stability of a variety of vehicles, particularly when extra armor is used. Due to the extreme nature of the battlefield terrain, highly robust MR shock absorbers are needed. The assignment would include working with an experienced team of engineers to design, develop and test components and subsystems for robust MR fluid-based suspensions.
- 3) **Friction Study for Band Brake Applications:** The goal of this study is to develop a database for friction material pairings for use in band brake applications. The applicant will use ASTM methods to characterize both the static and dynamic friction coefficients for various metal-to-metal pairings as well as rubber-to-metal pairings. Of particular interest is the effect of surface finish, temperature, and applied load on the interaction between material pairs.
- 4) **Microelectronic Adhesives:** The undergraduate will work with two scientists on a project for improving technology for microelectronics adhesive materials. The project involves the synthesis of organic/inorganic hybrid materials for microelectronic applications. The goal of this project is to create new materials for microelectronics by combining simple organic/inorganic chemical reactions in complex ways. The materials from these reactions will be characterized using non-traditional analytical techniques.
- 5) **Thermal Management Materials:** New developments in the electronics industry have resulted in higher power chips. Unfortunately as chips are run at higher power, they dramatically increase the heat produced. New thermal management materials that exceed performance of current commercially available greases, gels and adhesives are necessary to meet the growing need for heat removal from microchips and chip packages. Additionally, harsh environments, such as in automotive and space applications, have special material requirements that must be met for the new materials to survive in such applications. Work would focus on formulating new materials to develop higher thermal conductivity products for applications in the microelectronics industry.

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- 6) **Process R&D:** The intern will participate in the identification and development of new and optimized processes for the manufacture of key chemical intermediates. Work involves set-up and execution of chemical reactions using new equipment, materials, and/or methods. A focus on safe and efficient process design, that maximizes the quality (purity, yield) and through-put (quantity, time) of the synthesized materials, is required. Attention to detail is critical to ensure that laboratory experiments (small-scale) translate to the production (large-scale) environment.
- 7) **Structural Adhesives:** Working with Lord Corporation scientists, the intern will develop in-house capabilities for static and dynamic fatigue testing of structural adhesives. Challenges involve developing the appropriate surface preparatory methods that allow the measurement of the adhesive's fatigue properties (and not other aspects of the test assembly). The surface preparatory methods must be tailored for both the substrate type as well as the chemical-basis of the adhesive. Optimization of the data collection method is also required to gather the appropriate information. The outcome of this work will expand the range of data that can be provided to customers to support their investigations into using structural adhesives in applications where welding or mechanical fastening methods have traditionally been used.
- 8) **Magnetic Circuit Design:** Mechanical vibration in helicopters, aircraft, machine tools, and industrial fans can be dramatically reduced by opposing the vibration with force producing actuators. These actuators typically create force at the vibration frequency by electromagnetic principles. In many applications, the space and weight for the actuators are limited. Therefore, the design of highly efficient magnetic circuits is needed. This assignment would involve working with experienced engineers to optimize design parameters, and evaluate the effects of environmental factors on the magnetic circuit and the performance of actuators used to actively control vibration.

Application Selection & Process

The NC Space Grant/Lord Corporation Summer Internship Program is open to current 2007-2008 undergraduate and graduate students who are enrolled in a STEM degree program at one of the NC Space Grant eleven member institutions.

Each applicant must submit an application (via mail or email), which can be downloaded at (link to be created). The deadline for submission of applications is Friday, March 28, 2008. Submission instructions are provided on the application.

Applications will be reviewed by NC Space Grant staff and Lord Corporation project researchers. The review committee will examine a number of criteria including academic achievement, resume, career goals, and references.

The NC Space Grant/Lord Corporation Summer Interns will be announced by April 15, 2008.

Award Amount and Requirements

The total value of the NC Space Grant/Lord Corporation Summer Internship Program is \$10,000 per student. Students will be paid a stipend of \$7,000 by Lord Corporation. NC Space Grant will provide \$3,000 for living expenses.

Selected students will be treated as Lord Corporation employees. As such, students will be asked to sign intellectual and non-disclosure agreements for Lord.

To ensure that all award requirements are met, selected students will be required to sign an acceptance letter. Furthermore, students will be required to submit a brief report (500-1000 words) that describes the impact of the internship on their educational and professional goals.

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Frequently Asked Questions

Q: What are the eligibility requirements?

A: Any student may apply as long as they meet the following requirements:

- Junior standing or higher, including graduate students in the 2008-09 academic year;
- US citizen;
- GPA of 3.0 or higher;
- Major in STEM discipline. Examples of related degrees include, but are not limited to, mechanical and aerospace engineering, materials science, physics, chemistry;
- Attend one of the NC Space Grant member institutions.

Q: If I am selected as a Summer Intern, what are my obligations?

A: The Intern's responsibilities are to:

- Accept the internship offer and sign an acceptance letter;
- Complete all Lord Corporation personnel information;
- Submit a brief report describing the impact of the internship on their educational and professional goals.

Q: Will I be guaranteed a job when I graduate?

A: No, but with the increasing shortage of professionals in science, technology, engineering, and math related fields, there will be a strong demand for a highly skilled workforce.

Contact Information

Questions regarding this announcement should be directed to Dr. Chris Brown, Director, or Ms. Jobi Cook, Associate Director, of the NC Space Grant at scholarships@ncspacegrant.org or (919) 513-2457.