

Rose-Hulman Institute of Technology

Rose-Hulman Undergraduate Research Experience in Mathematics
June 6 - July 31, 2009

Application Form

For full consideration, please send a cover letter, this application form, current college transcript (unofficial is acceptable) and arrange for two letters of recommendation (commenting on mathematical potential, preparation, motivation and work habits) to be sent to the following address by **Friday, February 27, 2009**.

Kurt Bryan
Department of Mathematics - REU
Rose-Hulman Institute of Technology
5500 Wabash Avenue
Terre Haute IN 47803

For an application form you may either print out this PDF document or contact the REU director for paper copies of the form and announcement:

Email: kurt.bryan@rose-hulman.edu
REU URL: <http://www.rose-hulman.edu/mathREU/>
Phone: (812) 877-8485
Fax: (812) 877-8883

Female, minority, and physically disabled students are encouraged to apply.

PROJECT DESCRIPTIONS

Computational Number Theory (Joshua Holden, 2007,2009): Just a few decades ago, cryptography was considered a domain exclusive to national governments and militaries. However, the computer explosion has changed that. Every day, millions of people trust that their privacy will be protected as they make online purchases or communicate privately with a friend. Many of the cryptographic algorithms they use are built upon a common transformation, namely discrete exponentiation modulo an integer “ n ”. For instance, Diffie-Hellman key exchange, RSA and the Blum-Micali pseudorandom bit generator all use discrete exponentiation. It is thought that the inverse of this transformation, the “discrete logarithm problem,” or “DLP” is computationally intractable. This is part of the basis for assuming the cryptographic security of the algorithms referred to above. However, there is no known proof of this fact.

Inverse Problems (Kurt Bryan, 2008, 2009): In the study of differential equations (ordinary or partial) we usually seek the solution to a differential equation given some initial and/or boundary conditions. In an *Inverse Problem* the situation is reversed: we are given some information about the solution to an “unknown” differential equation and seek to determine the differential equation itself. These kinds of problems come up frequently in the field of non-destructive testing or medical imaging, in which one seeks to image the interior of an object without damaging the object. To do this, some kind of energy—electromagnetic, thermal, or mechanical—is applied to the boundary of the object. The energy flows through the object in a quantifiable way that depends on the interior structure. By taking boundary measurements of the object’s physical response, one tries to deduce the interior structure of the object. In this project we will look at inverse problems related to finding interior defects—typically cracks or holes—in a material object.

Name _____

Citizenship _____ Birth Date _____

Expected Graduation Date _____

College Attending _____

College Mailing Address _____ Home Mailing Address _____

College Phone Number _____ Home Phone Number: _____

Cell Phone Number: _____

Preferred Email Address: _____

Spring Break Dates and Contact Info: _____

Area of Interest (1 for first choice, 2 for second, leave blank if not interested). For a brief description of the areas, see the cover sheet of the application, the program announcement, or the web page.

_____ **Computational Number Theory** (Josh Holden)

_____ **Inverse Problems** (Kurt Bryan)

References (two of your professors)

Name _____ Name _____

Address _____ Address _____

Email _____ Email _____

Phone _____ Phone _____

Course Information

Provide information about the upper-level mathematics courses you have taken relevant to your area(s) of interest in the table below. Use descriptive titles to describe the courses and topics covered.

Computational Number Theory	Inverse Problems
Relevant Courses: _____ _____ _____ _____ _____ _____ _____	Relevant Courses: _____ _____ _____ _____ _____ _____ _____
Text(s): _____ _____ _____ _____ _____ _____	Text(s): _____ _____ _____ _____ _____ _____
Topics Covered: _____ _____ _____ _____ _____ _____ _____ _____ _____	Topics Covered: _____ _____ _____ _____ _____ _____ _____ _____ _____

Computing Experience and Computing Languages _____

Additional honors, awards, prizes, information, etc.

Signature _____ Date _____

Include with your application a cover letter indicating why you are interested in attending the Rose-Hulman REU, your mathematical and other interests, your career plans, and any other information you care to add.