MSIT'11 Academy
Department of Mathematics
UCA Box 4912
201 Donaghey Avenue
Conway, AR 72035

Activities

The MSIT'11 Program will offer enriched activities for 9th, 10th, & 11th grade students in central Arkansas in mathematics and related fields of science. The MSIT'11 Program provides a setting that is conducive to active learning and the exchange of ideas related to theory and practice in the areas of Science, Technology, Engineering, and Mathematics. Our dynamic instructional environment integrates topics related to sciences and mathematics with hands-on activities. See the other side of this brochure for the activities and their descriptions. All sessions will be conducted by UCA professors.

General Information

While some refreshments will be provided, participants should bring their own lunch. Students will have computers available for computations. All activities will be conducted in the Mathematics and Computer Science building and Lewis Science Center of UCA. A map of the university will be included in the registration packet to show the drop-off and pick-up points for students. Applications will be processed in the order received. We encourage students to apply as soon as possible as there is a limitation on the space. Preference will be given to students in central Arkansas.

Contact Information

Complete information about the MSIT'11 Program (such as more detailed description, activities, and application materials) is available on our Website:
www.uca.edu/math/news/

For questions, contact:

Dr. Ramesh Garimella, Chair
Department of Mathematics
University of Central Arkansas
Conway, AR 72035
Phone: (501) 450-3147
Fax: (501) 450-5662
E-mail: rameshg@uca.edu

Program Information

***Fee:** **$75 per participant**

Dates: **July 18–22, 2011**

Time: **9:00 am - 4:30 pm**

Lunch time: **12:00-2:00 pm**
Bring your own lunch

Lunch time activities include:

- **UCA Planetarium**
- **Campus Tour**
- **Group Photo**
- **Whale exhibit**
- **Information on Math & Science programs at UCA**

Location:

Math and Computer Science Building
Lewis Science Center
UCA Campus

Eligibility:

Participant must be a 9th, 10th, or 11th grade student during 2010-11 school year.

Deadline for application:

June 1, 2011

***A limited number of fee waivers are available. For more information please call the number listed in the contact information.**

Dr. Ramesh Garimella, Chair
Department of Mathematics
University of Central Arkansas
Conway, AR 72035

University of Central Arkansas

MSIT'11 Academy

Mathematics, Science, & Information Technology Summer Academy July 18-22, 2011

Funded by the Arkansas Science & Technology Authority

Presented by
Department of Mathematics
&
UCA STEM Institute

MSIT'11 Academy: Mathematics, Science, & Information Technology Summer Academy

MSIT'11

Join the **MATHEMATICS, SCIENCE, & INFORMATION TECHNOLOGY SUMMER ACADEMY** for mathematically talented students in Summer 2011 (MSIT'11) at the University of Central Arkansas. This **one-week** program is designed for promising 9th, 10th, and 11th grade students in central Arkansas. The objective of the program is to stimulate and enhance interest in mathematics and its applications to the physical, biological, and computer sciences. Faculty from UCA's College of Natural Sciences and Mathematics will lead investigations that link their areas of specialty with realistic and scientific applications. Participants will conduct experiments, collect and analyze data, develop mathematical models utilizing computers, and use the results to make predictions and solve problems involving cryptology, detecting molecular details, magnetic resonance imaging, and computational revolution.

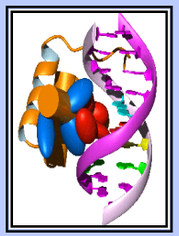
Cryptology
Dr. R. Garimella & Dr. R.B. Lenin
Department of Mathematics

Cryptography is the art of secret communication. It involves transforming a plain message into an unintelligible text so that nobody other than the intended receiver will be able to decipher and comprehend the message. Due to rapid usage of modern communication technologies, security has become a serious concern in terms of tampering with vital messages that are being transmitted over the Internet or handheld

A great deal of modern cryptography depends upon the basic number theory especially clever manipulations of large integers, modular arithmetic, and use of software such as *Excel* or *Mathematica*. In this program, students will be introduced to essentials of number theory, modular and cryptography, including the famous RSA encryption. Students will gain hands-on experience in encrypting and decrypting messages.

Detecting Molecular Details
Dr. Don Perry and Dr. Lori Isom
Department of Chemistry

The realms of biochemistry and physical chemistry offer distinctive methods for investigating molecular structure. In biochemistry, X-ray crystallography, is used to obtain three dimensional molecular structural information. In this activity, students will view the molecular structure of proteins and DNA involved in the cloning, production, and detection of a jellyfish glowing protein. In a similar way, physical chemistry methods explore the structure and reactivity of molecular systems on the nanoscale. The activities involve the synthesis of nanoscale chemical systems followed by the analysis of the nanoparticles with a range of analytical techniques including infrared, UV-VIS, and mass spectral techniques.

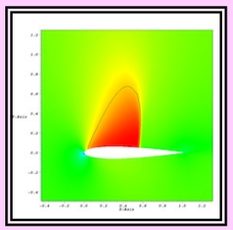


Functional Magnetic Resonance Imaging (fMRI)
Dr. Patrick Carmack
Department of Mathematics

Within the last decade, technological advances in magnetic resonance imaging have allowed us to peer into the brain's inner workings. There are companies that claim they can tell when a person is lying and offer their services to screen potential employees. This activity is intended to introduce the basic technology behind fMRI and what we can and, perhaps more importantly, cannot do with the current state of fMRI. Activities will then focus on the myriad of statistical and mathematical modeling problems associated with this data. Students will learn to use a popular point-and-click brain analysis package known as SPM. The course will end with students analyzing actual fMRI data.

The Computational Revolution
Dr. Clarence Burg
Department of Mathematics

Many, if not most, of the recent advances in medical, engineering and science have benefited from the insight provided by computational simulations. Medical devices such as heart pumps, the next generation space shuttle, and global climate predictions rely on computational simulations to understand the complicated interactions and behaviors of these physical systems. Using UCA's Callisto computer cluster, in conjunction with state-of-the-art software, students will build 2D and 3D computational geometries of wings, airplanes, and buildings and compute the flow past these objects. Students will learn about the various steps in creating a computational simulation. Students will either make an animation of the physical phenomena or create images for a poster displaying their work.



Registration Form

Student Name _____

Parent/Guardian Name _____

Address _____

City _____

State_____Zip _____

Home Phone# _____

E-mail_____

Grade in 2010-2011_____

School attended _____

_____

Are you interested in on campus overnight accommodations? (Subject to availability)

☐ **Yes** ☐ **No**

(For additional information/rates call 501-450-3147)

Name of activity you would like to attend:

(check one box):

- ☐ **Cryptology**
- ☐ **Detecting Molecular Details**
- ☐ **Functional Magnetic Resonance Imaging (fMRI)**
- ☐ **The Computational Revolution**