**2013 UC Davis Winter Robotics Academy**

--- **Robotics for STEM Education in the 21st Century**

[http://c-stem.ucdavis.edu/training/winter_academy](http://c-stem.ucdavis.edu/training/winter_academy)

**Time:** February 23-24 & March 2-3, 2013; 8:30am - 5:00pm

**Location:** 1062 Bainer Hall, UC Davis campus

**Deadline for Early Registration:** February 8, 2013

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**Program Description**

Robotics can easily get students engaged and excited in learning science, technology, engineering, and math (STEM) concepts with fun. The UC Davis C-STEM Center and its industrial partners have developed an innovative modular robotics technology for integrating computing, robotics, and engineering into K-12 math and science education. A modular robot is designed as a building block. However, a single module is a fully functional four-degrees-of-freedom modular robot. This full mobility allows a modular robot to perform a multitude of novel robot locomotion, including inch-worming, rolling, arched rolling, turning, and standing up. Multiple modules can be interconnected into various geometries and programmed for different applications, such as a snake, four-legged walker, and humanoid. Extending the existing C-STEM computing and Algebra curriculum, this Robotics Academy provides professional development for math/science/technology teachers with the cutting-edge robotics and teaching technology to engage students on critical thinking and collaborative learning of math, science, and engineering with the 21st century career skills. The academy will train teachers on computer-aided problem solving using a user-friendly C/C++ interpreter Ch and modular robot to integrate computing and robotics into STEM courses.

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**Topic Outline**

The 2013 UC Davis Winter Robotics Academy is split into two weekends. The first weekend is an introduction to Computer Programming in C/C++. The second weekend is for programming modular robots for STEM Education. If you have prior computer programming experience in C/C++, you may just register for training in the second weekend. Outlines for each weekend are listed below.

**Computer Programming in C/C++ (the first weekend, February 23-24)**

- How a computer works
- Writing your first C program
- Variables in algebra and their applications in computing
- Math expressions and operators, and their applications in computing
- Selection statements and loops in C (Logical reasoning, critical thinking, and their applications Graphing and Solving Quadratics)
- Modular programming with functions in C (Writing functions and plotting)
- Arrays for processing data in C (Visualize experimental and measurement data)

**Programming Modular Robots for STEM (second weekend, March 2-3)**

- Controlling Robots Using a Control Panel
- Introduction to Programming for Robots
- Interacting with robots through variables and input/output functions
- Controlling single robots with code
- Controlling multiple robots through programs
- Writing programs to control multiple robots to perform identical tasks
**Intended Audience**

This Academy is geared toward grades 5-12 teachers and afterschool program paraeducators, who teach Algebra Readiness, Pre-Algebra, Algebra I, Engineering, Technology, Robotics, Physical Science, and other STEM courses. More specifically:

1. Teachers who are interested in learning new ways to engage students in analytical thinking and problem solving skills where traditional methods have failed.
2. Teachers who want to teach “at risk” and credit deficient students using hands-on activities and project-based methods in STEM subjects to close the achievement gap.
3. Teachers who want to teach “gifted” students to excel in math with hands-on activities and project-based methods.
4. Teachers who are looking to increase their use of computers and robotics as a teaching and learning tool.
5. Teachers who are interested in providing their students with 21st century career skills.

**Outcome for Trainees’ Students**

1. Through a set of interactive computing, robotics, and applied problem solving activities in a C/C++ interpreter Ch, students will gain a better understanding of abstract math concepts and their applications.
2. Students will learn the fundamentals of computing and robotics, underlying working principles of computing, robotics, engineering, and computer programming for problem solving.
3. Students will be able to participate in RoboPlay Competitions and Math Programming Competition on the UC Davis C-STEM Day on May 4, 2013. See Link: http://c-stem.ucdavis.edu/activities/c-stem_day/

**Registration**

- Cost: $200 / weekend / teacher before **February 8, 2013**; $225 after February 8, 2013.
- The two weekend training is split into two pieces. The weekend of February 23-24 is focused on C/C++ programming topics. The weekend of March 2-3 implements the programming while focusing on the Modular Robot developed by Barobo, Inc. Teachers with prior C programming experience should be able to skip the first weekend of the training.
- A modular robot Mobot-I can be bought at the time of registration for $150.
- Registration covers instruction, supplementary textbooks, teaching materials, software licenses for teaching, morning beverage, lunch, UC Davis C-STEM Center support for implementation of the program. **A laptop running Windows or Mac OS X is necessary during the training.**
- 16 Professional Development Credit hours upon training completion for teachers in Yolo County (Sacramento and other counties pending on the approval of school districts).
- Hotels in West Sacramento are available which offer competitive prices for attendees from outside the greater Sacramento area.
- Please register through the website http://c-stem.ucdavis.edu/training/CREST/WinterAcademy before the early registration deadline of **February 8** to reserve your space.
- We must have received your payment before instruction has begun on February 23rd in order for you to be able to participate. Checks can be brought in person on the morning of February 23rd, thirty minutes before the instruction.
- Make check payable to “The Regents of the University of California”. Send check and the application form below to:

  Kevin Gucwa, Director Assistant  
  UC Davis K-14 Outreach Center for Computing and STEM Education, UC Davis  
  One Shields Avenue, Davis, CA 95616; Phone: (530) 752-1028; Email: kgucwa@ucdavis.edu

**Organizer** the UC Davis K-14 Outreach Center for Computing and STEM Education (C-STEM)  
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**Instructors** Harry H. Cheng and Kevin Gucwa (UC Davis C-STEM Center)