



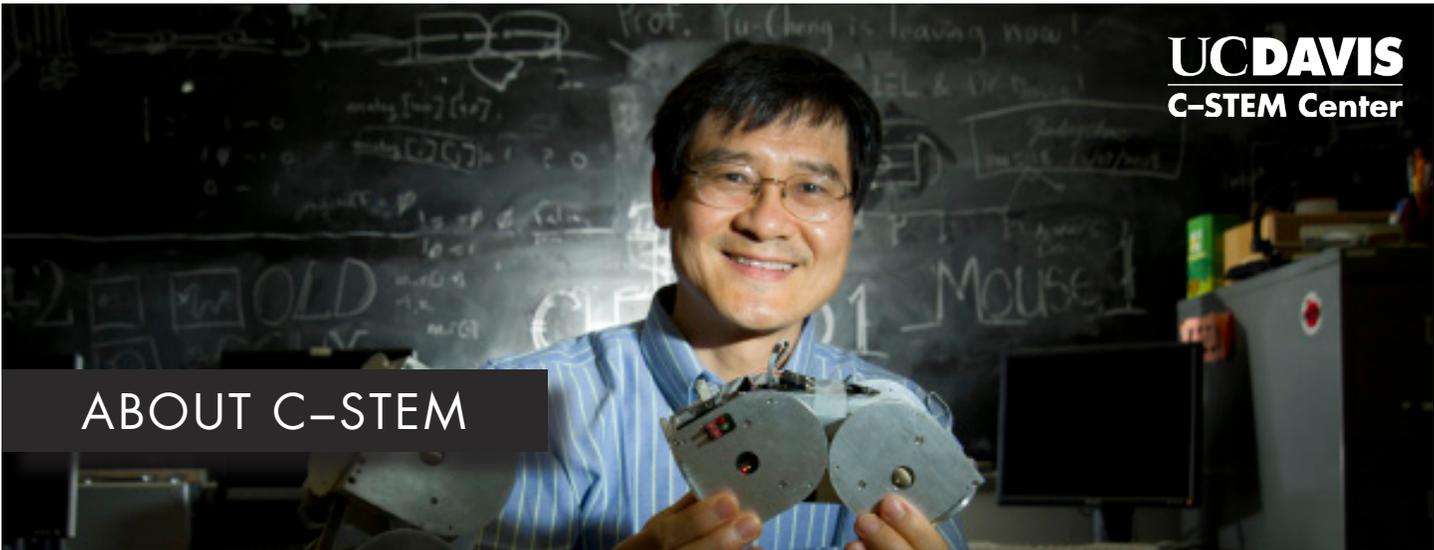
## UC DAVIS CENTER FOR INTEGRATED COMPUTING AND STEM EDUCATION (C-STEM)

Implementation Brochure - 2018/2019

Transforming math education through computing.

**UC DAVIS**  
**C-STEM Center**

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



## ABOUT C-STEM

The UC Davis C-STEM Center aims to transform computing, science, technology, engineering and mathematics (C-STEM) education in both formal and informal in K-14 programs through integrated learning, guided by two key objectives:

- Close the achievement gap by broadening participation of students traditionally underrepresented in computing and STEM related careers and post-secondary study.
- Develop students' 21st century problem-solving skills to tackle real world concerns through integrated computing and STEM education.

Through cutting edge research with funding from the National Science Foundation, the C-STEM Center, in collaboration with our industry partners, has developed innovative educational computing and robotics technologies for K-14 hands-on learning. By working with K-14 educators, the C-STEM Center integrates computer programming and robotics into teaching STEM subjects by creating project-based computing and robotics activities, integrated curriculum, and hands-on personalized and collaborative learning strategies aligned with Common Core State Standards and CTE Standards. This integration helps students make meaningful connections between regular STEM topics and their relevance to real life applications as well as help develop students' critical thinking and problem-solving skills while preparing all students to be career and college ready.

C-STEM joins a distinguished group of programs with UC A-G Program Status. Schools can easily add the A-G approved rigorous C-STEM curriculum to their own school's A-G course lists to satisfy the UC/CSU admission requirements. C-STEM is also a UC Approved Educational Preparation Program for Undergraduate Admission for all UC campuses, meaning that participation in the C-STEM program is recognized in the UC admissions process as achievements that have explicitly prepared students for college and career.

The C-STEM Center and our partners organize annual curriculum-based RoboPlay Competitions in various regions to further engage students in project-based team activities and to showcase their accomplishments and creativity in not only math and engineering, but also in writing, art, music and film production. The C-STEM Center provides unique professional development for STEM educators who have no prior computer programming or robotics experience to implement C-STEM curriculum in both formal and informal programs. Working together, we can transform K-14 education and inspire students to pursue computing and STEM related careers and post-secondary study.

**Harry H. Cheng**

C-STEM Center Director and Professor

## C-STEM SCHOOL ANNUAL SUBSCRIPTION

ANNUAL FEE	FEE PER SCHOOL SITE
ELEMENTARY SCHOOLS (K-6)	\$600
MIDDLE SCHOOLS (K-8, 6-8)	\$800
HIGH SCHOOLS (6-12, 9-12)	\$1000

Subscribing as a C-STEM school, you become a true partner in working with the entire C-STEM team and community on integrated computing and STEM education. The C-STEM Math-ICT curriculum provides K-12 students with 13 years of integrated math education with hands-on computing and robotics. The rigorous C-STEM program integrates innovative technology and pedagogy to help close the math achievement gap and provide all students with the skills needed to succeed in college and industry. Subscription includes many benefits for an unlimited number of teachers, students, courses, and sections in both the academic year and summer programs.

## C-STEM TEXTBOOKS PRICE LIST (OPTIONAL)

Book Title	Pages	Price/Book
Learning Common Core Mathematics with C/C++ Interpreter Ch for Algebra 1	450+	\$55
Learning Common Core Mathematics with C/C++ Interpreter Ch for Integrated Math 1	450+	\$55
Learning Common Core Mathematics with C/C++ Interpreter Ch for Math 7 and Math 8	350+	\$40
Learning Computer Programming with Ch for the Absolute Beginner	200+	\$30
Learning C Programming: An Introduction to Computer Science	200+	\$30
Learning Robot Programming with Linkbot for the Absolute Beginner	400-	\$45
Learning Robot Programming with Lego Mindstorms for the Absolute Beginner	400-	\$45
Learning Physical Computing with Arduino for the Absolute Beginner	200+	\$30
Learning Physical Computing with Raspberry Pi for the Absolute Beginner	200+	\$30

- All C-STEM textbooks are in full color.
- Prices only available to C-STEM schools.
- Prices are for ordering 25 copies or more per book. See Page 8 for ordering less than 25 copies.
- All prices listed in this brochure are subject to change without notice

# C-STEM PROFESSIONAL DEVELOPMENT

C-STEM provides unique professional development for teachers without any prior computing, robotics, and making experience to offer C-STEM curriculum as stand-alone courses or integrate them into the existing STEM courses and after school programs. C-STEM Center offers several programs geared towards implementing different C-STEM curricula.

**1-DAY WORKSHOP ON RASPBERRY PI AND ARDUINO:** This C-STEM 1-Day Workshop will provide K-14 teachers with hands-on experience on physical computing using general purpose input/output (GPIO) pins with Raspberry Pi and Arduino, control of Linkbot and NXT/EV3 robots through Pi, and how to bring physical computing and free C-STEM resources into their classroom teaching of STEM, computer science, making, and robotics courses.

**2-DAY WORKSHOP:** This C-STEM 2-Day Workshop will provide K-14 teachers with hands-on experience on how to use C-STEM Studio and RoboBlockly, as well as C-STEM Math-ICT curriculum with interactive coding, making, and robotics that aligns with the Common Core Math and ICT Sector standards to develop students' 21st century problem-solving skills and better prepare students for college and careers.

**2-DAY ACADEMY:** The C-STEM Academy on Integrated Computing and STEM Education in various regions will provide K-14 teachers with hands-on experience on how to use freely available C-STEM Studio and RoboBlockly, as well as C-STEM integrated curriculum with interactive computing, programming, and robotics that aligns with the Common Core Math and ICT Sector standards for their classroom teaching.

**1-WEEK INSTITUTE:** The intensive C-STEM 1-Week Institute on Integrated Computing and STEM Education is designed to provide professional development for K-14 teachers on the principles of robotics and computing and how to integrate them into STEM classes. Teachers learn computer programming, computational thinking, and problem-solving with coding using freely available C-STEM Studio and RoboBlockly.

**1-WEEK WORKSHOP:** The C-STEM 1-Week Workshop on Arduino, Raspberry Pi, and Cyberphysical Systems provides professional development for K-14 teachers on electronics and sensors using Arduino through the freely available C-STEM Studio in Ch Arduino, ChIDE, and Arduino IDE. Ch Arduino is a simple graphical user interface to interact with I/O pins of Arduino boards.

**ON-SITE PROFESSIONAL DEVELOPMENT\*:** C-STEM also provides tailored on-site professional developments.

NUMBER OF PARTICIPANTS	ONE DAY COURSE	TWO DAY COURSE	THREE DAY COURSE	FOUR DAY COURSE	FIVE DAY COURSE
8-12	\$1,800	\$3,000	\$4,500	\$6,000	\$7,500
13-20	\$3,000	\$4,500	\$6,750	\$9,000	\$11,250
21-30	\$4,200	\$6,000	\$9,000	\$12,000	\$15,000

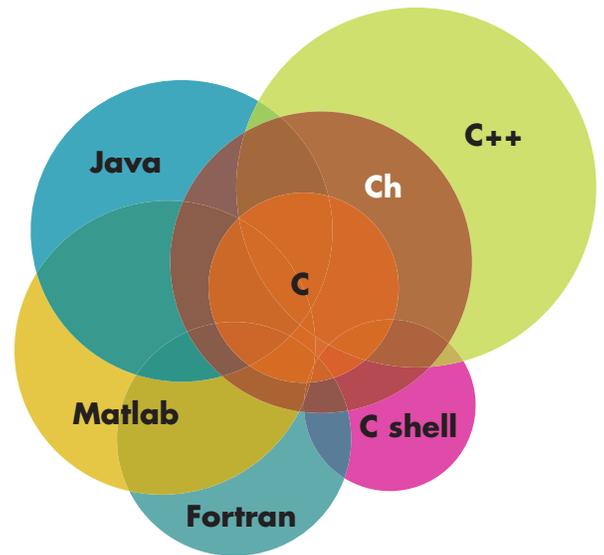
- \* The C-STEM's qualified trainers can come to your site and offer classes for groups of teachers. You supply the training room, computers, robots (or robot kits), and books. We supply the trainer.
- \* Please contact us for courses tailored to your school setting. For schools outside an 35 mile radius of Davis, CA, additional travel expenses apply.

# SOFTWARE PACKAGE THROUGH

## Ch: THE SIMPLEST POSSIBLE COMPUTING IN C/C++

- A C/C++ interpreter with interactive capabilities
- Easy to master by instructors and students
- Ideal for classroom use, making beginners' learning experiences more enjoyable and fostering students' interest in STEM disciplines
- Aids learning the most widely used programming language, C/C++, in both industry and colleges and prepares students to be career and college ready
- Can be used for controlling robotics and learning programming and STEM subjects
- Supports easy graphical plotting and quick animation capabilities
- Has a user-friendly development environment (ChIDE) with syntax highlighting and debugging capabilities
- Supports most C++ features for object-based programming
- Runs in Windows, Mac OS X, Linux, and Raspberry Pi

C/C++ Interpreter Ch Professional Edition	Up to 15 machines	Up to 35 machines
Annual Subscription (free product upgrade and technical support included) <b>C-STEM Price</b>	\$170	\$300
Annual Subscription (free product upgrade and technical support included) <b>Regular Price</b>	\$349	\$599



```
hello.ch - ChIDE - Professional Edition
File Edit Search View Tools Debug Options Language Buffers Help
Start Continue Abort Step Next Up Down Break Clear Parse Run Stop
1 hello.ch
1  /* File: hello.ch
2     Print 'Hello, world' on the screen. */
3
4     printf("Hello, world\n");
5
>ch -u "hello.ch"
Hello, world
>Exit code: 0
li=5 co=1 INS (LF)
```

# LINKBOT, ARDUINO, AND RASPBERRY PI KITS THROUGH **Barobo™** (OPTIONAL)

## LINKBOT - A BREAKTHROUGH EDUCATIONAL MODULAR ROBOT

- A fully functional robot with two degrees of freedom powered by an internal recharge-able lithium-ion battery good for all day use.
- Specially designed for integrated computing and STEM education using the C/C++ interpreter Ch and the C-STEM curriculum.
- SnapConnectors allow modules to be snapped together without special tools to create a snake, tank, humanoid, and any system that can be imagined.
- Integrated standard thread holes allow for custom-made accessories. Many accessory CAD files are freely downloadable for 3D printing, laser cut, or CNC manufacturing.

LINKBOT STARTER KIT	
Linkbot -I	1
Snap Connector	3
3.5" Diameter Wheel	2
Ball Caster	1
USB Cable	1
8"x10" Resealable Bag	1
1 Year Extended Warranty	1
<b>Price</b>	<b>\$199.99</b>

LINKBOT SUPER KIT	
Linkbot - I	1
Linkbot Dongles	1
Snap Connector	3
3.5" Diameter Wheel	2
4.0" Diameter Wheel	2
Ball Caster	1
Push Scoop	1
Hacky Sack	1
USB Cable	2
8"x10" Resealable Bag	1
1 Year Warranty	1
<b>Price</b>	<b>\$249.99</b>

C-STEM ROBOPLAY PACK	
Linkbot- L	1
Snap Connector	6
Gripper Pair	1
8"x10" Resealable Bag	2
Bridge Connector	2
Cube Connector	1
Hacky Sack	1
USB Cable	1
<b>Price</b>	<b>\$349.99</b>



Linkbot Starter Kit



Linkbot Super Kit

C-STEM ROBOPLAY BUNDLE	
Linkbot- I	4
Linkbot- L	1
Linkbot Dongle	1
Snap Connector	15
3.5" Wheel	8
Ball Caster	4
Push Scoop	2
Gripper Pair	1
Bridge Connector	2
Cube Connector	1
8-Port USB Cable	1
USB Cable	6
Activity Mat	1
8"x10" Resealable Bag	5
18"x20" Resealable Bag	1
Regular Price	\$1,299.99
C-STEM Price	\$1,104.99

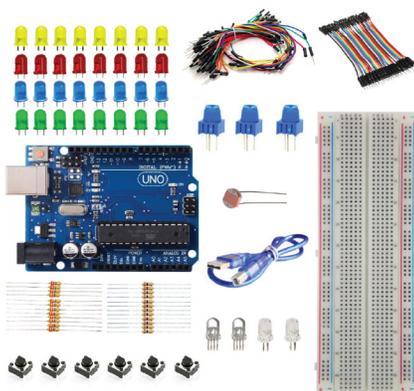
16 STUDENT CLASSROOM BUNDLE	
Linkbot- I	16
Snap Connector	48
3.5" Diameter Wheel	32
4.0" Diameter Wheel	32
Ball Caster	16
Push Scoop	16
Hacky Sack	16
Activity Mat	1
8-Port USB Charger	2
USB Cable	16
Carry Case	1
Regular Price	\$3,599
C-STEM Price	\$3,059.15

32 STUDENT CLASSROOM BUNDLE	
Linkbot- I	32
Snap Connector	96
3.5" Diameter Wheel	64
4.0" Diameter Wheel	64
Ball Caster	32
Push Scoop	32
Hacky Sack	32
Activity Mat	2
8-Port USB Charger	4
USB Cable	32
Carry Case	2
Regular Price	\$6,999
C-STEM Price	\$5,949.15

ADDITIONAL ACCESSORIES	
Activity Mat	\$29
Linkbot Dongle	\$39
RoboPlay Challenge Mat (2015, 2016, 2017, 2018)	\$99.99 each

\* If you purchase the 16 or 32 Student Classroom Bundles, C-STEM Roboplay Pack is needed for each team to participate in RoboPlay Challenge Competition.

## ARDUINO AND RASPBERRY PI KITS



### Uno Starter Kit (pictured)

- 1 Arduino-compatible Uno board
- Accessories and sensors curated for C-STEM Physical Computing curriculum

### Uno and Pi Sensor Pack

- Additional accessories and sensors curated for C-STEM curriculum

### Raspberry Pi Kit Starter Kit

- 1 Raspberry Pi (3 Model B or B+)
- Clear case
- Breakout connector and other accessories

Arduino and Raspberry Pi Kits	Price
Uno Starter Kit	\$34.99
Uno and Pi Sensor Pack	\$34.99
Raspberry Pi Starter Kit	\$69.99

# C-STEM IMPLEMENTATION COST

	COST	QUANTITY	TOTAL COST
<b>ANNUAL C-STEM SUBSCRIPTION FEE*</b>			
Elementary Schools (K-6)	\$600		
Middle Schools (K-8, 6-8)	\$800		
High Schools (K-12, 6-12, 9-12)	\$1,000		
<b>C-STEM TEXTBOOKS</b>			
	<b># OF COPIES</b>		
<b>BOOK TITLE</b>	<b>&lt;25 COPIES</b>	<b>≥25 COPIES</b>	
Common Core Mathematics with C/C++ Interpreter Ch for Alg 1	\$70	\$55	
Common Core Mathematics with C/C++ Interpreter Ch for Int Math 1	\$70	\$55	
Common Core Mathematics with C/C++ Interpreter Ch – Abbr. for Math 7 and 8	\$52	\$40	
Computer Programming with Ch for the Absolute Beginner**	\$39	\$30	
C Programming: An Introduction to Computer Science	\$39	\$30	
Robot Programming with Linkbot for the Absolute Beginner**	\$59	\$45	
Robot Programming with Lego Mindstorm for the Absolute Beginner**	\$59	\$45	
Learning Physical Computing with Arduino for the Absolute Beginner	\$39	\$30	
Learning Physical Computing with Raspberry Pi for the Absolute Beginner	\$39	\$30	
**C-STEM schools can freely download Ch, Robotics and 3D Printing books in PDF			
<b>PROFESSIONAL DEVELOPMENT</b>			
1-Day Workshop on Physical Computing with Raspberry Pi, Arduino, and Robots	\$150		
2-Day Academy or 2-Day Workshop	\$300		
1-Week Institute	\$750		
1-Week Workshop	\$975		
<b>SOFTWARE PACKAGE FOR C-STEM PARTNER SCHOOLS</b>			
<b>C/C++ INTERPRETER CH PROFESSIONAL EDITION</b>			
Raspberry Pi	FREE		
Up to 35 machines per year for Windows and Mac* (Pay to Softintegration)	\$300		
<b>LINKBOT, ARDUINO, AND RASPBERRY PI KITS FOR C-STEM PARTNER SCHOOLS (Pay to Barobo)</b>			
16 Student Classroom Bundle	\$3,059.15		
32 Student Classroom Bundle	\$5,949.15		
Linkbot Starter Kit	\$199.99		
Linkbot Super Kit	\$249.99		
C-STEM Roboplay Pack	\$349.99		
C-STEM Roboplay Bundle	\$1,104.99		
Roboplay Challenge Mat (2015, 2016, 2017, 2018)	\$99.99 each		
Linkbot Dongle	\$39		
Activity Mat	\$29		
(Arduino) Uno Starter Kit	\$34.99		
Uno Sensor Kit	\$34.99		
Raspberry Pi Kit	\$69.99		
	<b>TOTAL COST</b>		

## COMPUTERS AT SITE\*

- PCs Needed, 1:1 access (student:computer)
- Windows XP or higher, Mac OS X, Raspberry Pi, and Chromebook.



## INTEGRATED COMPUTING AND STEM EDUCATION FOR BOTH FORMAL AND INFORMAL K-14 PROGRAMS

### UC Davis Center for Integrated Computing and STEM Education

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University of California, Davis  
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Davis, CA 95616  
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Email: [info@c-stem.ucdavis.edu](mailto:info@c-stem.ucdavis.edu)

### Harry H. Cheng, Ph.D

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PROFESSOR, DEPARTMENT OF MECHANICAL  
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**UCDAVIS**  
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California Department of  
**EDUCATION**



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