



# 4-H ROBOTICS PROJECT



## 4-H THRIVE

### Help Youth:

#### Light Their Spark

A spark is something youth are passionate about; it really fires them up and gives them joy and energy. Help youth find how this project excites them.

#### Flex Their Brain

The brain grows stronger when we try new things and master new skills. Encourage youth effort and persistence to help them reach higher levels of success.

#### Reach Their Goals

Help youth use the GPS system to achieve their goals.

**Goal Selection:** Choose one meaningful, realistic and demanding goal.

**Pursue Strategies:** Create a step-by-step plan to make daily choices that support your goal.

**Shift Gears:** Change strategies if you're having difficulties reaching your goal. Seek help from others. What are youth going to do when things get in their way?

#### Reflect

Ask project members how they can use their passion for this project to be more confident, competent and caring. Discuss ways they can use their skills to make a contribution in the community, improve their character or establish connections.

Robotic elements can help improve human quality of life. Whether robots are used to explore dangerous environments, diffuse bombs, replace limbs, or just make life easier, the use of robots is becoming increasingly more common. In the robotics project, youth will learn about the interconnections of science, engineering, and technology.

- Learn about the basics of robotics, including platform, drive, and control systems.
- Engage in scientific inquiry around motion, forces, chemistry, electricity, etc.
- Design robotic solutions to engineering challenges.
- Build, construct, and test robotic contraptions, and redesign.

#### Starting Out *Beginner*

- Learn about the vast variety of robots being used in the world.
- Explore the differences between form and function.
- Engage in the engineering design process with simple challenges.
- Learn about motion, forces, and electricity.
- Record designs and reflection in an engineering notebook.

#### Learning More *Intermediate*

- Explore 3-D space. Build robotic arms that can move and grip without direct physical control.
- Employ the engineering design process by designing, building, and testing a contraption to meet a design challenge.
- Learn about engineering constraints and tradeoffs.
- Build a robotic rover.
- Experiment with buoyancy and building an underwater robot.

#### Exploring Depth *Advanced*

- Explore mechantronics, the connection between electrical and mechanical systems.
- Learn about number systems and programming logic.
- Program a robotic controller for automatic guidance.
- Participate in robotics competitions.
- Employ a variety of sensors on your robot.

The activities above are ideas to inspire further project development. This is not a complete list.



# Expand Your Experiences!

## Science, Technology, Engineering, and Mathematics

- Experiment with friction by testing various rover wheels on different surfaces. Record results.
- Design and build an underwater ROV to collect water samples for water quality testing.
- Find a way to use robots in 4-H animal science or agricultural projects.
- Attach a GPS unit to a robotic rover and use it for GIS mapping.

## Healthy Living

- Find out more about how robots are used in medical procedures and surgery.
- Explore how robotic sensors can test the nutritional value of food.
- Build a robotic rover to lead a workout routine.

## Citizenship

- Design a service learning project that uses robotics elements in its implementation.
- Learn more about how robots have changed industry and the nature of work in the U.S.
- Find out more about federal laws that govern the use of robots.
- Program a robot to lead the flag salute.

## Leadership

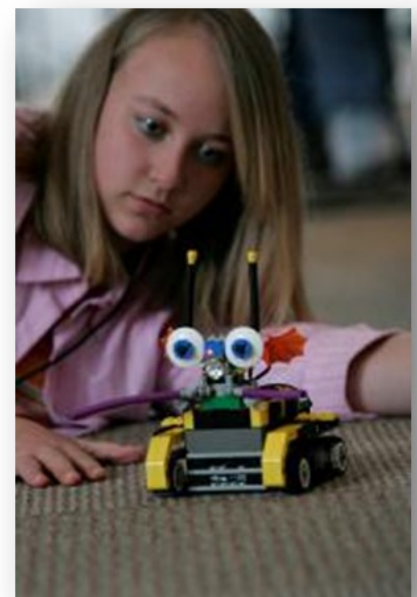
- Become a role model for others by taking the position of junior/teen leader.
- Lead a robotics workshop for younger members.
- Plan and implement a robotics educational event in your community.

## Resources

- 4-H Robotics Resources  
<http://www.4-h.org/resource-library/curriculum/4-h-robotics/facilitator-resources/>
- FIRST  
<http://www.usfirst.org/>
- California 4-H Robotics  
<http://www.ca4h.org/Projects/SET/Tech/IDR/>
- LEGO® Mindstorms® NXT  
[www.mindstorms.lego.com](http://www.mindstorms.lego.com)
- GEAR-Tech-21  
<http://4hset.unl.edu/itest/index.php>
- VEX® Robotics Design System  
<http://www.vexrobotics.com/>
- UC Davis C-STEM Center  
<http://c-stem.ucdavis.edu/>

The UC 4-H Youth Development Program does not endorse, warrant, or otherwise take responsibility for the contents of unofficial sites.

Connections & Events	Curriculum	4-H Record Book
<p><b>Presentation Days</b> – Share what you’ve learned with others through a presentation.</p> <p><b>Field Days</b> – At these events, 4-H members may participate in a variety of contests related to their project area.</p> <p>Contact your UC Cooperative Extension office to determine additional opportunities available, such as a field day.</p>	<p><b>4-H Robotics: Engineering for Today and Tomorrow</b></p> <ul style="list-style-type: none"> <li>• Virtual Robotics—<a href="http://www.4-h.org/resource-library/curriculum/4-h-robotics/virtual-robotics/">http://www.4-h.org/resource-library/curriculum/4-h-robotics/virtual-robotics/</a></li> <li>• Junk Drawer Robotics—<a href="http://www.4-h.org/resource-library/curriculum/4-h-robotics/junk-drawer-robotics/">http://www.4-h.org/resource-library/curriculum/4-h-robotics/junk-drawer-robotics/</a></li> <li>• Robotics Platforms—<a href="http://www.4-h.org/resource-library/curriculum/4-h-robotics/robotics-platforms/">http://www.4-h.org/resource-library/curriculum/4-h-robotics/robotics-platforms/</a></li> </ul>	<p>4-H Record Books give members an opportunity to record events and reflect on their experiences. For each project, members document their experiences, learning and development.</p> <p>4-H Record Books also teach members record management skills and encourage them to set goals and develop a plan to meet those goals.</p> <p>To access the 4-H Record Book online, visit <a href="http://ucanr.edu/orb/">http://ucanr.edu/orb/</a></p>



## University of California Agriculture and Natural Resources

*Light Your Spark*

*Flex Your Brain*

*Reach Your Goals*

*Light Your Spark*

*Flex Your Brain*

*Reach Your Goals*



## FOR FUTURE INFORMATION

To order or obtain ANR publications and other products, visit the ANR Communication Services online catalog at <http://anrcatalog.ucanr.edu/> or phone 1-800-994-8849. You can also place orders by mail or request a printed catalog of our products from

University of California  
Agriculture and Natural Resources  
Communication Services  
2801 Second Street  
Davis, CA 95618  
Telephone 1-800-994-8849  
E-mail: [anrcatalog@ucanr.edu](mailto:anrcatalog@ucanr.edu)

©2018 The Regents of the University of California. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

### Publication 8622

ISBN-13: 978-1-62711-052-5

The University of California, Division of Agriculture and Natural Resources (UC ANR) prohibits discrimination against or harassment of any person in any of its programs or activities on the basis of race, color, national origin, religion, sex, gender, gender expression, gender identity, pregnancy (which includes pregnancy, childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), genetic information (including family medical history), ancestry, marital status, age, sexual orientation, citizenship, status as a protected veteran or service in the uniformed services (as defined by the Uniformed Services Employment and Reemployment Rights Act of 1994 [USERRA]), as well as state military and naval service.

UC ANR policy prohibits retaliation against any employee or person in any of its programs or activities for bringing a complaint of discrimination or harassment. UC ANR policy also prohibits retaliation against a person who assists someone with a complaint of discrimination or harassment, or participates in any manner in an investigation or resolution of a complaint of discrimination or harassment. Retaliation includes threats, intimidation, reprisals, and/or adverse actions related to any of its programs or activities.

UC ANR is an Equal Opportunity/Affirmative Action Employer. All qualified applicants will receive consideration for employment and/or participation in any of its programs or activities without regard to race, color, religion, sex, national origin, disability, age or protected veteran status.

University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's equal employment opportunity policies may be directed to: John Sims, Affirmative Action Contact and Title IX Officer, University of California, Agriculture and Natural Resources, 2801 Second Street, Davis, CA 95618, (530) 750-1397. Email: [jsims@ucanr.edu](mailto:jsims@ucanr.edu). Website: [http://ucanr.edu/sites/anrstaff/Diversity/Affirmative\\_Action/](http://ucanr.edu/sites/anrstaff/Diversity/Affirmative_Action/).

To simplify information, trade names of products have been used. No endorsement of named or illustrated products is intended, nor is criticism implied of similar products that are not mentioned or illustrated.



An electronic copy of this publication can be found at the ANR Communication Services catalog website, <http://anrcatalog.ucanr.edu/>. This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by ANR Associate Editor for Human and Community–Youth Development Lynn Schmitt-McQuitty.

### California 4-H Project Sheet Series Authors

JOHN BORBA, 4-H Youth Development Advisor, UC Cooperative Extension, Kern County; CLAUDIA DIAZ, 4-H Youth Development Advisor, UC Cooperative Extension, Riverside and San Bernardino counties; MARCEL HOROWITZ, Healthy Youth, Families, and Communities Advisor, UC Cooperative Extension, Yolo County; ANNE IACCOPUCCI, 4-H Healthy Living Academic Coordinator, California State 4-H Office; SHANNON KLISCH; UC CalFresh Community Education Supervisor, UC Cooperative Extension, San Luis Obispo County; KENDRA LEWIS, 4-H Evaluation Academic Coordinator, California State 4-H Office; KATHERINE SOULE, Youth, Families, and Communities Advisor and Director of UC Cooperative Extension, San Luis Obispo and Santa Barbara Counties; and STEVEN WORKER, 4-H Youth Development Advisor, UC Cooperative Extension, Marin, Napa, and Sonoma counties.

*Light Your Spark*

*Flex Your Brain*

*Reach Your Goals*

*Light Your Spark*

*Flex Your Brain*

*Reach Your Goals*