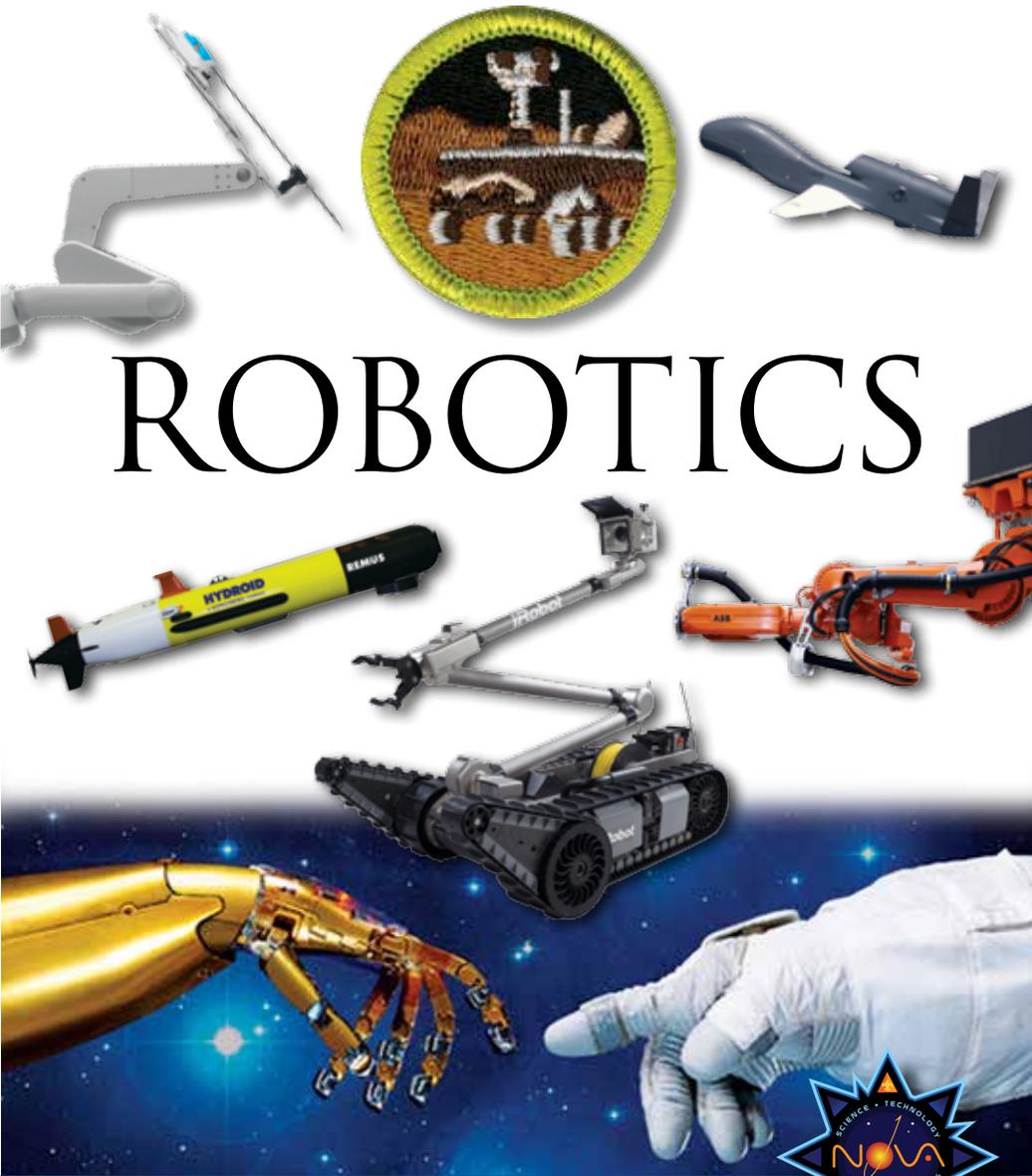


MERIT BADGE SERIES



ROBOTICS



BOY SCOUTS OF AMERICA®



STEM-Based

BOY SCOUTS OF AMERICA
MERIT BADGE SERIES

ROBOTICS



"Enhancing our youths' competitive edge through merit badges"



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Requirements

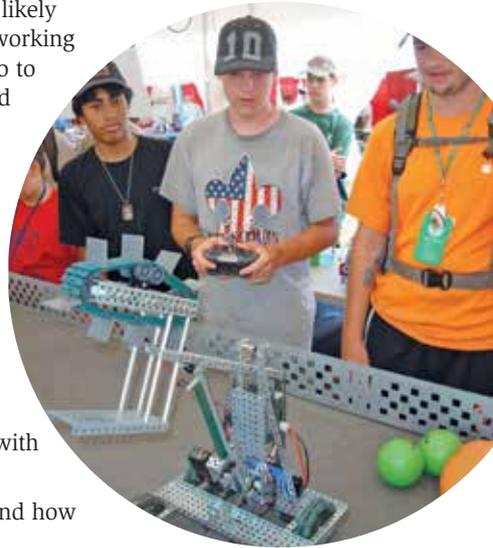
1. Safety. Do each of the following:

- a. Explain to your counselor the most likely hazards you may encounter while working with robots and what you should do to anticipate, mitigate and prevent, and respond to these hazards. Describe the appropriate safety gear and clothing that should be used when working with robotics.
- b. Discuss first aid and prevention for the types of injuries that could occur while participating in robotics activities and competitions, including cuts, eye injuries, and burns (chemical or heat).

2. Robotics industry. Discuss the following with your counselor:

- a. The kinds of things robots can do and how robots are best used today.
- b. The similarities and differences between remote-control vehicles, telerobots, and autonomous robots.
- c. Three different methods robots can use to move themselves other than wheels or tracks. Describe when it would be appropriate to use each method.

3. General knowledge. Discuss with your counselor three of the five major fields of robotics (human-robot interface, mobility, manipulation, programming, sensors) and their importance to robotics development. Discuss either the three fields as they relate to a single robot system OR talk about each field in general. Find pictures or at least one video to aid your discussion.





4. Design, build, program, test. Do each of the following:
 - a. With your counselor's approval, choose a task for the robot or robotic subsystem that you plan to build. Include sensor feedback and programming in the task. Document this information in your robot engineering notebook.
 - b. Design your robot. The robot design should use sensors and programming and have at least 2 degrees of freedom. Document the design in your robot engineering notebook using drawings and a written description.
 - c. Build a robot or robotic subsystem of your original design to accomplish the task you chose for requirement 4a.
 - d. Discuss with your counselor the programming options available for your robot. Then do either option 1 OR option 2.
 - (1) Option 1. Program your robot to perform the task you chose for your robot in 4a. Include a sample of your program's source code in your robot engineering notebook.
 - (2) Option 2. Prepare a flowchart of the desired steps to program your robot for accomplishing the task in 4a. Include procedures that show activities based on sensor inputs. Place this in your robot engineering notebook.

- e. Test your robot and record the results in your robot engineering notebook. Include suggestions on how you could improve your robot, as well as pictures or sketches of your finished robot.
5. Demonstrate. Do the following:
 - a. Demonstrate for your counselor the robot you built in requirement 4.
 - b. Share your robot engineering notebook with your counselor. Talk about how well your robot accomplished the task, the improvements you would make in your next design, and what you learned about the design process.
 6. Competitions. Do ONE of the following.
 - a. Attend a robotics competition and report to your counselor what you saw and learned about the competition and how teams are organized and managed.
 - b. Learn about three youth robotics competitions. Tell your counselor about these, including the type of competition, time commitment, age of the participants, and how many teams are involved.
 7. Careers. Name three career opportunities in robotics. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.



Robotics Resources

Scouting Literature

Composite Materials, Digital Technology, Electricity, Electronics, Engineering, First Aid, Game Design, Home Repairs, Inventing, Metalwork, Model Design and Building, Programming, Safety, Space Exploration, Textile, Welding, and Woodwork merit badge pamphlets

Visit the Boy Scouts of America's official retail website (with your parent's permission) at www.scoutstuff.org for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

- Clark, Dennis, and Michael Owings. *Building Robot Drive Trains*. McGraw-Hill, 2002.
- Cook, David. *Robot Building for Beginners*, 2nd ed. Apress, 2010.
- Domaine, Helena. *Robotics*. Lerner, 2005.
- Gibilisco, Stan. *Concise Encyclopedia of Robotics*. TAB Books, 2002.
- Henderson, Harry. *Modern Robotics: Building Versatile Machines*. Chelsea House, 2006.
- Mataric, Maja J. *The Robotics Primer*. MIT Press, 2007.
- McComb, Gordon. *Constructing Robot Bases*. McGraw-Hill, 2003.

———. *Robot Builder's Bonanza*, 4th ed. McGraw-Hill, 2011.

- Payment, Simone. *Robotics Careers: Preparing for the Future*. Rosen, 2011.
- Petruzzellis, Thomas. *Electronics Sensors for the Evil Genius*. McGraw-Hill, 2006.
- Predko, Myke. *123 Robotics Experiments for the Evil Genius*. McGraw-Hill, 2004.
- Randolph, Ryan P. *Robotics*. Rosen, 2009.
- Valk, Laurens. *The LEGO® Mindstorms® NXT 2.0 Discovery Book: A Beginner's Guide to Building and Programming Robots*. No Starch Press, 2010.
- Williams, Karl. *Build Your Own Humanoid Robots*. McGraw-Hill, 2004.

The Boy Scouts of America's Supply Group has kits available that fit requirements for the Robotics merit badge. Go to www.scoutstuff.org for more information.

DVDs

- NOVA: *The Great Robot Race*. PBS, 2006.
- Robotics*. History Channel, 2001.

Online Resources

- "How to Build a Robot." Razor Robotics, www.razorrobotics.com/building-robots

“How to Make a Robot.” GoRobotics.net, www.gorobotics.net/articles/how-to-make-a-robot-lesson-1

“Robotics Tutorials.” ElectronicsTeacher.com, www.electronicsteacher.com/robotics/robotics-tutorial/plain-robotics

Also see the websites and sources described under “Robotics Competitions” (See “Resources for Kits and Competitions”).

The next time you are online or at the bookstore, check out magazines like *Robot*, *Servo*, *Nuts and Volts*, and *Popular Science*. These publications are great resources for robotics-related information.

Organizations

American Society of Mechanical Engineers

3 Park Ave.
New York, NY 10016-5990
Toll-free telephone: 800-843-2763
Website: www.asme.org

AUVSI Foundation Robotic Competitions

Association for Unmanned Vehicle Systems International
Website: www.auvsi.org
AUVSI Foundation website: www.auvsifoundation.org

Carnegie Mellon Robotics Academy

Computer Science Social Network
Website: www.education.rec.ri.cmu.edu

Institute of Electrical and Electronics Engineers

2001 L Street, NW, Suite 700
Washington, DC 20036-4910
Phone: 202-785-0017
Website: www.ieee.org

National Robotics Week

Website: www.nationalroboticsweek.org

RoboGames

Website: www.robogames.net

Robotics Education and Competition Foundation

Website: www.roboticseducation.org

Technology Student Association

1914 Association Drive
Reston, VA 20191-1540
Toll-free telephone: 888-860-9010
Website: www.tsaweb.org

Robotics Merit Badge: Get Interactive

Get ready to unlock the BSA's first interactive merit badge resource center! Enhance your merit badge learning experience by tapping into a mind-blowing explosion of videos, games, activities, photos, the latest resources, and much more. Visit www.boyslife.org/robotics.

Acknowledgments

The Boy Scouts of America greatly appreciates members of the Robotics merit badge advisory group for their assistance with developing the merit badge and pamphlet. A number of them are active volunteers in the Scouting program and are robotics competition mentors and experts. Their input, expertise, time, and other resources have been invaluable.