Robotics Badges: ***Programming Robots 1***

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: Robotic Solutions

- **Prepare Ahead:** Cut out the **Robot Challenge Cards** from the handout. You'll need at least 1 card for every group of 2–3 girls, so you may need to create multiple decks.
- Paper for each girl
- Pencils or pens for each girl

ACTiVITY 2: OPENING CEREMONY: Introduction to Programming Robots

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Learn About Robots

- **Robot Challenge Cards** from As Everyone Arrives: Robotic Solutions
- Descriptions from As Everyone Arrives: Robotic Solutions
- **Prepare Ahead:** Cut out the **Real Robots Cards** from the handout.

ACTIVITY 4: Build a Robot Part: Robot Arm

- Rulers
- Scissors
- Duct tape
- Clear packing tape
- Foam tape squares
- **Optional:** hot glue gun (with adult supervision)
- Water
- Liquid food coloring, at least 2 different colors

For each team of 2–3 girls:

- Medium-sized corrugated or other sturdy cardboard box
- Extra cardboard (you can cut the top off the box to use as scrap)
- 2 paper towel tubes (or fold scrap cardboard into square tubes)
- 4 10-milliliter (mL) oral syringes with rubber rings (sometimes available free at pharmacy counters, or buy in bulk online)
- Two 2-foot-long pieces of ¼ inch wide clear vinyl tubing (available in hardware stores)
- Sharpened pencil stub (approximately 3 ½ inches)
- **Instructions to Build a Hydraulic Arm**

ACTIVITY 5: Learn How Robot Systems Work Together

- Robot arms from Activity 4: Build a Robot Part: Robot Arm
- Paper for each girl
- Pencils or pens for each girl

Robotics Badges: *Programming Robots 2*

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: Robot Tasks

- **Robot Task Sheets,** at least one sheet for each group of 2–3
- Paper for each girl
- Pen or pencil for each girl

ACTIVITY 2: OPENING CEREMONY: Robot Control and Coding

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Learn About Programming

- Pen or markers
- Chart paper or whiteboard
- **Flowchart Symbols** handout, for each group of 2–3
- **Sample Algorithm Flowcharts,** for reference

ACTIVITY 4: Write a Program for a Robot

- Flowcharts from Activity 3: Learn about Programming
- **Writing Pseudocode** handout, for each group of 2–3
- Paper for each girl
- Pen or markers for each girl
- Chart paper or whiteboard

ACTIVITY 5: CLOSING CEREMONY: Awards

- Programming Robots award, one for each girl

(**Note to Volunteers:** You can buy these awards from your council shop or the Girl Scouts' website.)

Robotics Badges: *Designing Robots 1*

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: Collaborative Storytelling

- **Explorer Robot Photos**
- **Optional:** If you want to find your own photos of "explorer" robots to share, search for the word "robots" together with the words such as "space," "ocean," "volcano," "extreme conditions," "rescue," etc. Other possible sources include government agencies such as NASA , NOAA, or DARPA.

ACTIVITY 2: OPENING CEREMONY: Design a New Kind of Robot

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Pick a Challenge

- **Robot Build Plan,** one for each girl or team of 3–4
- Pens or pencils, enough for each girl
- Paper, enough for each girl

ACTIVITY 4: Explore Possible Solutions

- In progress Robot Build Plans
- Pens or pencils, enough for each girl
- Several sheets of paper for each girl

ACTIVITY 5: Plan Your Prototype

- In progress Robot Build Plans
- Pen or pencils, enough for each girl
- Several sheets of paper for each girl
- **Optional:** Create a list of materials you plan to have available for building robot prototypes in Designing Robots 2. See below the list of Tilt Sensor materials for a suggested list.

For each sensor (per girl or team of 3–4):

- **Model Tilt Sensor Instructions,** one for each girl or team
- 2–4 LEDs in different colors, with the longer wire leg or lead around 1 inch long (available from hobbyist electronics/robotics parts retailers online)
- 3 volt (3V) coin battery (such as CR2032)

Safety Note:

- The battery used in this project is too small to give you a shock. However, if the positive and negative sides are connected accidentally, the battery may get hot or cause a fire. This is called a short circuit. Do not connect the positive and negative sides of the battery. The positive and negative sides will touch either side of the LED while in the circuit.
- **Caution: Coin batteries are dangerous if swallowed!** Do not leave them where small children and pets can get to them.

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- Medium plastic or paper cup (16 ounce works well)
- Aluminum foil tape, cut into 2 small strips (½ inch by 2 inch) and 2 larger strips (1 inch by 1 foot); the foil tape is sold in duct-tape-size rolls in the heating duct aisle of hardware stores
- 3 or more metal paperclips (metal must be visible, no paint or plastic covering)
- Clear tape
- Scissors
- **Optional:** craft knife, such as an X-Acto knife

Suggested materials for robot prototypes (to be built in Designing Robots 2) include:

- **Crafts materials:** Construction paper/cardstock, tape (duct, electrical, foam), glue (hot glue, glue dots), zip ties, twist ties, pipe cleaners, craft sticks
- **Household supplies:** Drinking straws, bamboo skewers, balloons, batteries, rubber tubes and oral syringes, foil tape, wire
- **Recycled materials:** Cardboard boxes and canisters, bottle caps (for wheels), electric toothbrushes (for motors)
- **Electronics parts:** Motors, LEDs, wires, test leads/alligator clip wires
- **Old toys:** RC car, dolls or action figures, stuffed animals
- **Building sets:** LEGO®, K'Nex
- **Electronics or robotics kits:** LittleBits, LEGO® Mindstorms, VEX
- **Microcontrollers:** Adafruit Circuit Playground Express, micro:bit
- **Tools:** Scissors, box cutter (or kid-safe plastic cardboard knife), screw drivers, wire cutters, safety goggles (if necessary)

Robotics Badges: *Designing Robots 2*

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: Refine Your Robot Design

- **Robot Build Plans** from Designing Robots 1
- Pens or pencils for each girl
- Paper for each girl

ACTIVITY 2: OPENING CEREMONY: Review the Design Thinking Process

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Build a Prototype

Present a selection of materials based on the **Robot Build Plans** created in Designing Robots 1.

Suggested materials include:

- **Crafts materials:** Construction paper/cardstock, tape (duct, electrical, foam), glue (hot glue, glue dots), zip ties, twist ties, pipe cleaners, craft sticks
- **Household supplies:** Drinking straws, bamboo skewers, balloons, batteries, rubber tubes and oral syringes, foil tape, wire
- **Recycled materials:** Cardboard boxes and canisters, bottle caps (for wheels), electric toothbrushes (for motors)
- **Electronics parts:** Motors, LEDs, wires, test leads/alligator clip wires
- **Old toys:** RC car, dolls or action figures, stuffed animals
- **Building sets:** LEGO®, K'Nex
- **Electronics or robotics kits:** LittleBits, LEGO® Mindstorms, VEX
- **Microcontrollers:** Adafruit Circuit Playground Express, micro:bit
- **Tools:** Scissors, box cutter (or kid-safe plastic cardboard knife), screw drivers, wire cutters, safety goggles (if necessary)

Safety Note:

- Girls should use care handling cutting tools, the hot glue gun and batteries.
- Girls should ask for adult help if they are unsure how to use a tool.

Other materials you will need for the activity:

- **Robot Build Plans** from As Everyone Arrives: Refine Your Robot Design
- Pens or pencils for each girl
- Paper for each girl
- Camera (phone)

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ACTIVITY 4: Get Feedback on Your Robot

- **Robot Build Plans** from As Everyone Arrives: Refine Your Robot Design
- Pens or pencils for each girl
- Paper for each girl
- Camera (phone)
- **Optional:** Materials for girls to continue building and improving their robots.
- **Optional Prepare Ahead:** If anyone in the group knows people who might actually use the kind of robot any of the teams are designing, ask if they would be willing to come in to give their feedback on the teams' prototype. Alternatively, you could bring in Girl Scouts from other troops, friends, or family to give feedback.

ACTIVITY 5: CLOSING CEREMONY: Awards

- Designing Robots award, one for each girl

  (**Note to Volunteers:** You can buy these awards from your council shop or the Girl Scouts' website.)

Robotics Badges: ***Showcasing Robots 1***

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: Make an Info Sheet for Your Robot

- **Robot Presentation Info Sheet,** one for each girl
- Robots from Designing Robots 2
- Pens or pencils for each girl
- Paper for each girl

ACTIVITY 2: OPENING CEREMONY: Showcasing Robots

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Create a Presentation about Your Robot

- Filled out **Robot Presentation Info Sheets** from Activity 1: As Everyone Arrives: Make an Info Sheet for Your Robot
- Pen or pencil for each girl
- Paper for each girl
- **Optional:** Robot prototypes from Designing Robots 2

ACTIVITY 4: Present Your Robot Pitch to Others for Feedback

- Presentations created in Activity 3: Create a Presentation about Your Robot

ACTIVITY 5: Hold a Mini Robotics Competition

For each robot (one per girl or for groups of 2–3):

- 1 small vibrating motor disc, 3 volts or less (sometimes listed as "pager motors" or "phone motors;" comes as a disc or as a cylinder with a weight on a rotating shaft)
- 1 3-volt coin battery (such as BR1225 or CR2032)
- Lightweight materials for the body, such as recycled plastic or cardboard containers, caps to jars or bottles, clothespins, etc.
- Materials to use as legs, such as bent paper clips, round beads, or sections of toothpicks or bamboo skewers
- Decorations such as pipe cleaners and googly eyes

Safety Note:

- The battery used in this project is too small to give you a shock. However, if the positive and negative sides are connected accidentally, the battery may get hot or cause a fire. This is called a short circuit. If batteries feel warm, turn the power off.
- Do not connect the positive and negative sides of the battery. The positive and negative sides will touch either side of the load while in the circuit.
- Be careful when cutting wires and using other tools. Never cut wires connected to a battery, electrical outlet or plug.
- If you are cracking open the outside casing of a device, wear safety goggles to keep broken bits from flying into your eyes.
- **Caution: Coin batteries are dangerous if swallowed!** Do not leave them where small children and pets can get to them.

- **Optional:** Toothbrush head (cut off with pliers or heavy scissors) to make a “programmable” body by bending the bristles

Enough to share:

- **Mini Robot Building Instructions**
- Scissors
- **Optional:** wire cutters, wire strippers
- Adhesive and connectors, such as: small foam tape squares, electrical tape, hot glue, adhesive dots, zip ties, twist ties, rubber bands
- Large, flat, smooth sheet of cardboard or other material (to be the field for the challenge)

Robotics Badges: *Showcasing Robots 2*

Materials List for Seniors

ACTIVITY 1: AS EVERYONE ARRIVES: What Do You Want to Know?

- Pens or pencils for each girl
- Paper for each girl

ACTIVITY 2: OPENING CEREMONY: Women in Robotics

- Flag
- **Optional:** Poster Board with the Girl Scout Promise and Law

ACTIVITY 3: Explore Robotics Opportunities in High School, College and Beyond

- Pen or pencil for each girl
- Paper for each girl
- **What Kind of Roboticist Are You?** handout for each girl

ACTIVITY 4: See Robot Makers and Robots in Action

- If you are going on a field trip, bring anything you need for the trip.
- If you are doing a video call or watching videos of interviews or talks, bring computers or other equipment.

ACTIVITY 5: CLOSING CEREMONY: Awards

- Showcasing Robots award, one for each girl

(**Note to Volunteers:** You can buy these awards from your council shop or the Girl Scouts' website.)