



Junior AUTOMOTIVE ENGINEERING Badges

BADGE SERIES OVERVIEW:

In the Automotive Engineering badge series, Juniors discover how vehicles are designed, engineered, and manufactured.

To earn the Automotive Design badge, Juniors explore the future of transportation and mobility to come up with an idea, sketch, and sculpt a model of their vehicle.

To earn the Automotive Engineering badge, Juniors look at the future of automotive engineering. They build, test, and improve prototypes of alternative fuel vehicles.

To earn the Automotive Manufacturing badge, Juniors explore assembly lines, the 5S system, quality control, and process innovation. They create their own assembly line to efficiently manufacture a set of vehicles.

NOTES TO VOLUNTEERS:

Follow the Badge Progression:

The Automotive Engineering badge series has been designed for girls to do each badge in order, building on what they've learned. For these badges, the order is:

- 1 Automotive Design
- 2 Automotive Engineering
- 3 Automotive Manufacturing

Use The Talking Points (But Make Them Your Own):

In each session, you'll find suggested talking points under the heading "SAY." Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.



Be Prepared (It's What Girl Scouts Do!):

Each meeting includes a "Prepare Ahead" section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed.

Use Girl Scouts' Three Processes: Girl-led, learning by doing, cooperative learning—these three processes are the key to making sure girls have fun in Girl Scouts and keep coming back.

"Learning by doing" and "cooperative learning" are built into these badges thanks to the hands-on activities. Remember to keep the meetings girl-led so you can help create an experience where girls know they can make choices and have their voices heard.

Leave Time for the Closing Ceremony: If girls are having fun doing an activity, you may be tempted to skip the Closing Ceremony so they can keep going—but the Closing Ceremony is absolutely key to their learning.

Here's why: When girls leave a meeting, they'll remember how much fun it was to do an activity, but they may not realize its relationship to the automotive process. For example, they may not realize that they just learned how engineers test their products—unless you tell them. When you do that, you turn a hands-on activity into a minds-on activity.

That's why the Closing Ceremony is so important. It's where you can connect the dots for Juniors by:

- Pointing out how they acted as automotive designers, engineers, or manufacturers. (For example: They created an assembly line to build a set of vehicles. They struggled a bit with a challenging activity—but they persisted. Now they know that they can solve hard problems if they keep trying.)
- Reminding girls that they are already automotive designers, engineers, or manufacturers—and that it's fun to solve problems using STEM!
- Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost girls' confidence and interest in STEM—and end the meeting on an upbeat note!

Tell Your Troop Story: As a Girl Scout leader, you're designing experiences that Juniors will remember their whole lives. Try to capture those memories with photos or videos. Juniors love remembering all they did, and it's a great way for parents to see how Girl Scouting helps their Juniors!

And please do share your photos and videos with GSUSA by emailing them to STEM@girlscouts.org (with photo releases if at all possible!).

To Prepare for the Meetings:

Before each meeting, you'll find an Overview, notes to Prepare Ahead, and a Materials List, all specific to that meeting.

Before each meeting, read through the meeting plan and any meeting aids. This will help you get familiar with the flow before each meeting.

Handouts specific to the meetings are listed in the Prepare Ahead section of each meeting under Meeting Aids. In addition, the following handouts are available in the Meeting Aids for every meeting:

- **Junior Automotive Engineering Badges–Materials List:** Each meeting has its own materials list. However, if you like to do all your supply shopping at one time, use this handout. It includes the materials needed for all three Junior badges.
- **Junior Automotive Engineering Badges–Glossary:** This is a list of words introduced in the three Junior Automotive Engineering badges with definitions.
- **Think, Pair, Share:** These facilitation tips will help you to make sure that every girl's voice is heard during brainstorming activities.

Go over words and careers girls can learn about. In the Prepare Ahead section for each meeting, you'll see a list of words and careers girls may or may not know and how to define them. You can find a full list of vocabulary and careers for the badge series in the **Junior Automotive Engineering Badges–Glossary**.

Gather materials for the badge activities.

Before each meeting, gather materials for the meeting's activities. Review the materials list to see what you already have or if there are items you can ask girls to bring. If your meeting location doesn't have a flag, bring a small one that you can take turns holding or hang in the room.

Each meeting includes its own materials list. However, if you like to do all your supply shopping at one time, use the **Junior Automotive Engineering Badges–Materials List**. It includes the materials needed for all three Automotive Engineering badges.

Automotive Engineering

BADGE BREAKDOWN

AUTOMOTIVE DESIGN 1

1. **As Girls Arrive:** Identify the Parts of a Vehicle
2. **Opening Ceremony:** Get Moving with Automotive Design
3. **Step 1:** Explore Mobility Across Time
4. **Step 2:** Conduct Automotive Market Research
5. **Step 3:** Create Your Vehicle's Design Criteria
6. **Closing Ceremony:** Solve Problems with Design

- Juniors explore different modes of transportation and mobility.
- They learn about the parts of a vehicle.
- They gather and analyze data to assess their customer needs.
- They create design criteria for a special purpose vehicle.
- They brainstorm future innovations in automotive design.

AUTOMOTIVE DESIGN 2

1. **As Girls Arrive:** Team Up to Refine Your Vehicle Design
2. **Opening Ceremony:** Explore the Automotive Design Process
3. **Step 4:** Sketch a Vehicle to Meet Your Criteria
4. **Step 5:** Sculpt & Share Your Vehicle
5. **Closing Ceremony:** Present Your Design & Awards

- Juniors finish designing their special purpose vehicles.
- They collaborate to review their design checklists and find ways to make their designs more sustainable.
- They create sketches of the interior and exterior of their special purpose vehicles.
- They sculpt their vehicle designs.
- They share their vehicle designs with the troop.
- At the end of the meeting, they earn the Automotive Design badge.

AUTOMOTIVE ENGINEERING 1

1. **As Girls Arrive:** Power Up with Automotive Engineering
2. **Opening Ceremony:** Explore Alternative Fuels
3. **Step 1:** Learn About Simple Machines in Vehicles
4. **Step 2:** Engineer a Vehicle That Uses Alternative Fuel
5. **Closing Ceremony:** Fuel the Future of Engineering

- Juniors explore how engineers build vehicles that meet a set of criteria.
- They learn about simple and compound machines in vehicles.
- They create an engineering plan for an alternative fuel vehicle based on a given set of criteria.
- They examine the pros and cons of different fuels as they look at why engineers are looking for alternative fuel sources.

AUTOMOTIVE ENGINEERING 2

1. **As Girls Arrive:** Choose Materials for Your Vehicle Prototype
2. **Opening Ceremony:** Take the Wheel with the Design Thinking Process
3. **Step 3:** Build a Vehicle Prototype
4. **Step 4:** Test & Revise Your Vehicle Prototype
5. **Step 5:** Share Your Vehicle Prototype & Testing Results
6. **Closing Ceremony:** Analyze Your Results & Awards

- Juniors work in teams to engineer an alternative fuel vehicle.
- They look at the Design Thinking Process.
- They build prototypes of their vehicles.
- They test their vehicle prototypes for agility, speed, and distance travelled.
- They use their testing results to improve the design of their vehicle.
- At the end of the meeting, they earn the Automotive Engineering badge.

AUTOMOTIVE MANUFACTURING 1

1. **As Girls Arrive:** Make a Sample Product
2. **Opening Ceremony:** Jump Into Automotive Manufacturing
3. **Step 1:** Experience the Manufacturing Process
4. **Step 2:** Learn About the Automotive Manufacturing Process
5. **Closing Ceremony:** Assembly Lines of the Future

- Juniors begin to explore how manufacturers efficiently assemble vehicles.
- They look at the 5S organization system and how it helps with manufacturing.
- They complete a task (make a set of bracelets) and then use 5S to organize an assembly line and complete the same task a second time.
- They brainstorm possibilities for the future of assembly lines and automotive manufacturing.

AUTOMOTIVE MANUFACTURING 2

1. **As Girls Arrive:** Use 5S to Build a Bronze Award Project
2. **Opening Ceremony:** Build Quality Into Automotive Manufacturing
3. **Step 3:** Plan Your Own Automotive Manufacturing Process
4. **Step 4:** Manufacture a Set of Vehicle
5. **Step 5:** Innovate Your Automotive Manufacturing Process
6. **Closing Ceremony:** Make Life More Efficient & Awards

- Juniors reverse engineer to create a manufacturing plan to assemble a set of vehicles.
- They follow the steps of 5S to set up an efficient assembly line and build the vehicles.
- They check their vehicles for quality by testing to see if their vehicles roll in a straight line and that all the parts are attached securely.
- They discuss their testing results and brainstorm ways to innovate their manufacturing process.
- At the end of the meeting, they earn the Automotive Manufacturing badge.

Badge Series and Meeting Length

- This series of badges has been designed to fit into six 90-minute troop meetings.
- There is no snack time scheduled in these meetings, but you can add 15 minutes of “wobble room” for snacks or activities that run long.
- The times given for each activity are recommended for troop meetings. However, before each meeting, review the amount of time given for each and decide if you think your troop will need more, less, or the same amount of time to complete them. Feel free to adjust the time for any of the activities as needed.
- Give girls 10- and 5-minute warnings before they need to wrap up the last activity so you'll have time for the Closing Ceremony.

Get Help from Your Family and Friends Network

Your Friends and Family Network can include:

- Girls' parents, aunts, uncles, older siblings, cousins, friends, etc.
- Other volunteers who have offered to help with the meeting.

Ask your Network to help:

- Bring materials or other supplies to the meeting.
- Assist with badge activities.
- Make snacks.

Award Connection

Girls earn three badges:

- Automotive Design
- Automotive Engineering
- Automotive Manufacturing



(Note to Volunteers: You can buy the badges from your council shop or the [Girl Scout Shop](#).)