2024 OCPS Super STEM Saturday
Junior Solar Sprint (JSS)
RULES

What is the JSS Competition?

Junior Solar Sprint (JSS) is a national engineering challenge where students design, construct and race a model-sized, solar-powered vehicle. Teams must use a regulation kit containing a solar electric (photovoltaic) panel and motor, which energizes the vehicle that they design and build. The other parts of the car are made from materials of the team's choosing. Teams present their designs and evidence of their engineering process through a student-created web page, where they are reviewed by a panel of judges. Teams then bring their vehicles to OCPS Super STEM Saturday to compete in the 20 meter, wire-guided sprint race. Cars are judged on design, innovation, and performance.

Who May Compete

JSS is open to teams of two (2) to four (4) students in grades four (4) through eight (8). The competition is divided into two divisions. Teams of mixed grade levels will compete in the division of the highest grade level student.

- Green Division - 4th - 6th grade.
- Blue Division - 7th and 8th grade.

Important Dates

Events	Date
Project Webpages Due	November 25, 2024 at 5 pm
Super STEM Saturday	December 7, 2024

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Requirements

Hybrid Vehicle Design and Construction

The vehicle must be designed to be a hybrid, with the ability to switch from solar power to battery power in the event of inclement weather or overcast skies.

	Vehicle Size
	The **dimensions** of a Junior Solar Sprint car **cannot exceed**: • Width: 30 cm • Length: 60 cm • Height: 30 cm
	Solar Panel and Motor
	JSS Kit: Each entry begins construction with a JSS kit available from Solar Made or Pitsco. The basic JSS kit contains a three-volt (3V) photovoltaic (PV) panel and matching motor. • The solar panel and motor **may not** be modified. Any modification to the solar panel or motor will result in disqualification. • The specific motor supplied with the panel (in the kit) must be used. If a replacement motor is needed, it must be purchased from the company that supplied the panel or from FSEC and be the model of motor originally supplied with the solar panel. • One solar panel and motor are permitted per car.
	Battery Holder
	• The vehicle must include a battery holder mounted on the vehicle that is capable of holding two AA batteries. • A switch or other easy to operate mechanism that can change where the power is coming from (from solar panel to motor to battery power to motor) is required. See Inclement Weather section for information on when batteries will be used. • No batteries will be carried on the vehicle unless directed by the race officials on the day of the event.
	Passenger/Payload (Ping-pong ball)
	• Each vehicle must be designed to carry or hold a metaphorical passenger or payload. • The passenger/payload is represented by a standard, unmodified table tennis ball (aka ping-pong ball) of approximately 40mm in diameter. • The ball may not be glued, taped, permanently affixed or wedged into the vehicle. • The car design must allow for the purposeful removal of the ball (passenger/payload) with minimal effort. If the passenger or payload is dislodged during the course of a time trial or race, it is considered a DNF (did not finish).

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Car Components and Steering Device:

	Car Components:
	Vehicle/Team name Each team, on their own, will research and acquire the appropriate materials and parts needed to complete their car: • wheels • axles • car body/chassis • wiring • battery holder • connectors • gears • steering device/eyelet • passenger/payload (ping-pong ball) holder
	The body may be made of any material and decorated at the team's discretion. Individual decals may be affixed, but the vehicle must have a three (3) centimeter square space or area on each side and the bottom that is available for the vehicle's Sprint number decal, which is provided by the race committee.
	The vehicle must be safe (no jagged/sharp edges or projectiles).
	At least one wheel must be driven by the motor.
	Any energy enhancing devices, like mirrors, must be attached to the vehicle.
	Steering Device
	Steering Device: **All JSS cars are required to have a mechanism (eyelet) permanently affixed to their chassis that keeps the vehicle on the racetrack guidewire (monofilament line).** This guidewire hovers one (1) centimeter (+/- .5cm) above the surface of the racetrack and helps to keep the vehicle in its lane. Proper placement of the eyelet or steering mechanism on the vehicle will allow for the most direct and efficient path to the finish line. The eyelet or steering device may be placed anywhere on the vehicle. This steering device must be able to be easily attached to the guidewire at the beginning of each heat by a team member and removed from the guidewire at the finish line by another team member. See some examples of eyelets on the next page. **Closed eyelets are not permitted on JSS cars.**
	Items not allowed / Disqualification
	The solar panel is not to be used as the vehicle's chassis. If the axles and wheels are connected directly to the solar panel, the vehicle will be disqualified.
	No radio control is permitted in Junior Solar Sprint cars.
	Closed eyelets are not permitted on JSS cars.

Failure to meet these expectations will result in disqualification.

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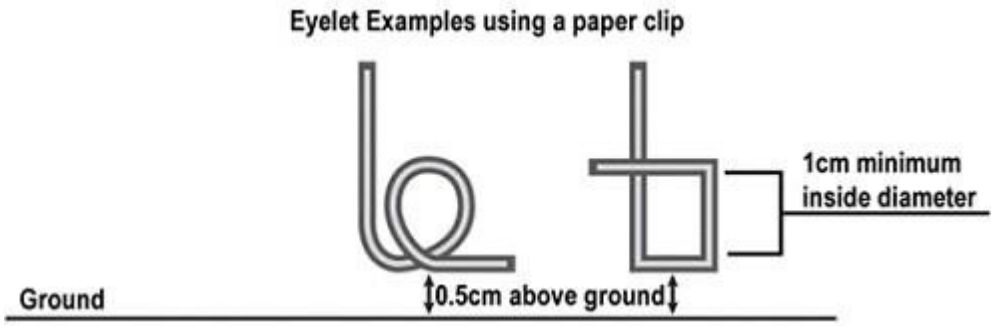
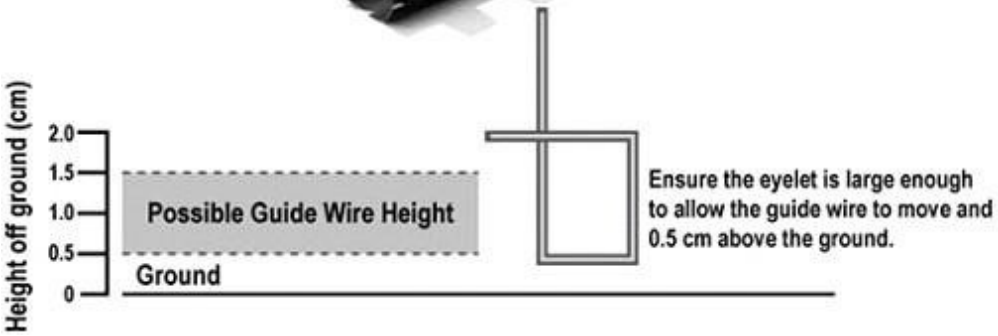
Steering Device/Eyelet Examples



1cm plastic comb binding splines make excellent eyelets and are quick to attach/remove from the guide wire.



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Web Page

Each team will create a web page on the OCPS Super STEM Saturday site showcasing their JSS vehicle. The web page will include basic team info, vehicle photos, notes on the design process, and a video describing important points of the car's design and decisions made by the team. This will be used to judge the vehicle's design and construction and will be viewed by students and the public.

The web page must include:

1.	**Photo & Basic Info**
	Vehicle/Team name
	Name of the School
	First name(s) and **last initials** of students on the team (**no last names on the public page**)
	Grade level of each team member
	A close-up photo of the completed vehicle/car (use this as the *Featured Image* on your page). Be sure the project photo is clear/visible.
2.	**Design Documentation**
	Photos - a minimum of six (6) photos of the completed car showing: 1. Front 3. Right Side 5. Underside 2. Back 4. Left Side 6. Top
	Project Log - The entries in the project log document each team meeting or work session. This can be a list, a table or an informal paper document that is scanned and inserted in the web page as photos. Entries include: ○ Date ○ Task or tasks ○ Time spent on the task or tasks ○ Team members present (initials or first names – no last names) ○ Obstacles encountered (if any) ○ Modifications to the car design (if any).
	Design drawings (minimum of 2) that include measurements and dimensions.
	Finished car specifications that include: car size _____ wheel size _____ weight _____ gear ratio _____
	List of components used and their cost. Recycled and reused items should be included and listed as such. Item / Cost / New/Reused/Recycled For example: Balsa wood / $3.00 / New Plastic soda bottle / $0 / Reused

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3. Vehicle Performance Test - (minimum of 3) that include at least one test under battery power			
Vehicle Test Information	Test 1	Test 2	Test 3
Solar or Battery Power			
Weather (Sunny, Cloudy, etc.,)			
Date and Time of day			
Distance Traveled			
Time Elapsed			
Speed (distance divided by time)			
Comments on performance			
Ideas for improving the car			

	4. Vehicle Features Video – (less than 5 minutes) to be included on your web page and hosted on our Vimeo site that includes one team member holding the vehicle while that team member or other members describe and explain the following:
	Features of the vehicle that make it special. The person holding the vehicle should point them out. Close-ups of these features are a must. Remember, the judges need to see them!
	Any unexpected outcome or discovery made by any team member as a result of the engineering, design building and testing process.
	How the vehicle performed when you tested it in the sunlight.
	Did you test the vehicle's performance under racing conditions (on a monofilament line)? Explain the results or why you did not test it on a monofilament line.

Teams are encouraged to use the judging criteria as a guide to what extras they may want to include in their web page. For example, the web page **may** include:

- extra photos of the design, building and testing process
- electric schematics of the car
- videos of test runs of the vehicle
- formulas or calculations used
- any items that the team feels will showcase their car or be helpful to the judges to pick them as the winning team!

Note: During the week prior to STEM Day, all JSS pages will be available for public viewing. Students are encouraged to share their web page address with family and friends, and to visit other team pages.

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Competition Day at OCPS Super STEM Saturday

All JSS teams will go to the ***Check-In*** table at the tennis courts where they will receive a number for their vehicle and have their vehicle inspected. If the vehicle does not pass inspection, the team may take their vehicle to the ***Fix-It*** area and make adjustments as necessary, under the guidance of a racing official. Once double elimination racing begins, any vehicles that do not meet the minimum requirements and fail to pass final inspection will not be allowed to race.

The JSS Race Format

When the number of entrants exceeds 12 vehicles per division, the race will be conducted in two phases: time trials and a head-to-head double elimination format competition for each division (Green Division, 4th- 6th and Blue Division, 7th & 8th) as outlined below. If the number of entrants is less than 12, all teams compete in the head-to-head competition. All final racing format decisions will be at the discretion of the lead JSS racing official(s).

1. Time Trials - starting time for each division's time trials will be posted the day of the race.	
	• Teams may run their vehicle on the track up to three times within the time allotted and at the Official's discretion. • Teams report to the starting line whenever they are ready to run; car numbers will not be called during the time trials. • The vehicle's time will be recorded after each run. • A vehicle's best time out of all its runs is used to rank the vehicles.
	The Time trials will be offered every two minutes for a given time period. Once time is called by the judges, no more runs are allowed.
	The ten teams in each division with the fastest individual run times will move on to the head-to-head, double elimination competition.
2. Head-to-Head Competition - is a ten-team, double elimination race	
	A team must lose twice before being eliminated from this part of the competition. Teams who have lost one race are to remain in the area to wait for their next race to be called.
	Teams will race against other teams in their division to determine the first, second, and third place Winners.

DECISIONS MADE BY THE RACE OFFICIALS ARE FINAL

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What happens if racing conditions are unfavorable (inclement weather)?

Partially Cloudy - The race will not be postponed for partly or mostly cloudy weather. Teams should be prepared to race in all moderate weather conditions.

Severely Overcast - If the solar irradiance averages less than 500 Wm2 during a 15 minute period (as measured by equipment at the track) just prior to the start of either the Time Trials or one of the head-to- head competitions, the race will be switched to battery power.
Teams will be provided with:

- (2) AA rechargeable batteries that have been charged and tested for charge level prior to distribution by the race officials
- a cover for the photovoltaic panel on the car.

Only the batteries supplied by FSEC may be used. Once a division race is changed to batteries, it will remain battery powered, regardless of increasing irradiance levels. (Note: a typical full sun day at solar noon in Florida is usually 1000 Wm2).

Rain/Thunderstorms - The race will be canceled if conditions are unsafe or if the track is unusable (too wet). If one division has raced, then only the second division's race will be canceled. If only the time trials have been run, those times will be used to award the race winners. If the time trial portion has not been completed, then only design awards will be given and no race will occur. All cancelation decisions will be made by the JSS administrative team. Once a race is canceled, it will not be reinstated even if the weather clears.

Evaluation and Judging

JSS vehicle design and innovation will be reviewed online by multiple judges and provided with a score based on the rubrics that follow. Final review of all projects happens in-person at OCPS Super STEM Saturday.

Best Design - 1st – 3rd Place Awards**:** Given to top three scoring teams in each division for best design.
Race Performance - 1st – 3rd Place Awards: Given to top three place teams at the end of the races.

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Judging Rubric

CATEGORY	BEST DESIGN	MAX POINTS
Chassis:	How well constructed is the frame? Were good design decisions used to improve the chassis or was it unaltered (merely a plain flat rectangular piece)?	14
Wheels & Axles:	How well are the wheels, axles, bearings/bushings designed, built and mounted? Are the axles parallel so that the car will run straight?	14
Steering Device:	Does the vehicle have a secure open eyelet or other such device to attach To the guidewire (monofilament line)? Was the vehicle tested on a guidewire?	14
Transmission:	How well mounted is the motor? Does the transmission (gears, belt, etc.) effectively transmit power to the wheels?	14
Solar Array:	How well oriented is the solar panel for light reception? Is the car designed to improve the way the solar panel is positioned, attached, or collects sunlight?	14
Craftsmanship Material Use & Appearance:	How well constructed is the car overall? Was care taken in the way the car was constructed? Is it sturdy? Has the team used unusual, recycled or earth-friendly materials and/or materials in an innovative way? Does the vehicle make a statement, convey a message or have a clear theme?	15
Web page:	Does the contents of the team web page document the design, building and engineering process in a way that the viewer can see how the vehicle works and see the special features that the team incorporated in their design?	8
Video:	Is the video component of the webpage clear and understandable? Did the team fulfill the video requirements? Did they communicate effectively?	7
	Design SCORE	100

GOOD LUCK TO ALL JSS TEAMS!