



GSU ENGINEERING DESIGN CHALLENGE 2018



RULES

The following are the rules that all teams must abide by for the Georgia Southern University Engineering Design Challenge (EDC) 2018:

1. Each team will design and build a vehicle within the specified design constraints. Design and fabrication of the vehicle will take place in independent locations (e.g., the high schools) between **November 2017 and April 2018**. Judging and the final competition will be held at Georgia Southern University - Armstrong Campus on **Saturday, April 28, 2018**.
2. Each high school may field one team of 4-6 students, at any grade level. The team will also have a Project Mentor who may be a high school teacher, a local volunteer engineer, and/or an GSU Student Coach (GSU engineering student). With the exception of high school teachers, all volunteers must be approved by the GSU's College of Engineering and Computing (CEC).
3. Participating teams need to submit completed applications via email to Mr. Christopher Williams at chris.williams@armstrong.edu, by **5 pm Friday, January 12, 2018**.
4. All team members, including Project Mentors and High School Students must sign release forms provided by GSU's CEC, prior to any activity associated with the EDC 2018.
5. The vehicle must be solely battery powered using the Electric Go Kart Power Kit (~\$300; <https://www.electricscooterparts.com/electric-go-kart-kit-137.html>) provided by GSU's CEC. The teams may not modify this electric power kit except as described in the rules.
6. In addition to the Electric Go Kart Power Kit, GSU's CEC will provide up to \$200 for each team to purchase materials. Teams may seek and utilize sponsorship from other sources up to \$500 maximum for a total budget maximum of \$700. The vehicle may be constructed of new or repurposed materials. Receipts of purchases and/or estimates of value of donated or repurposed materials **MUST** be documented in the engineering journals. The estimated value of donated/repurposed materials must be based on like-size/type material or equipment and be included in the overall budget. Adherence to the overall budget will be periodically verified by the GSU Student Coaches.
7. The main frame of the vehicle must be designed and constructed by the teams. If an existing commercial frame or an assembled store-bought kit is used for the frame, it must be a substantial modification of the same. Each team must submit a Preliminary Design Plan via email to Mr.



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Christopher Williams at chris.williams@armstrong.edu. These plans must be submitted and approved by the EDC Planning Team prior to purchase of materials and construction.

8. The vehicle must have at least 3 wheels and must be self-propelled (i.e., by electric battery). The vehicle cannot be plugged into an electrical outlet during its operation. Charging stations will be provided for the teams to charge batteries in between events on the day of the competition.
9. The vehicle should be designed to carry a single driver only.
10. A maximum of 2 gear ratios will be allowed. The vehicle should use an interchangeable gear/chain system and have steering and braking capability. Gears cannot be changed during a race. The steering and/or braking must use intermediary mechanisms that provide a mechanical advantage (i.e. the driver cannot directly touch drive train components such as wheels or the driver cannot directly touch the ground for braking). The braking system must be successfully demonstrated in order to compete in the competition. The demonstration must show that the vehicle can remain stopped at full power in its lowest gear.
11. Each driver must wear a helmet, goggles, gloves, closed-toe shoes, and protective clothing (such as jeans and long-sleeved shirt) any time the vehicle is powered. NO loose clothing. Any hair must be secured away from moving parts. There must be a chainguard that is effective and safely covers the chain with both sets of gears.
12. The vehicle should include an easily accessible emergency stop/shut-down system. This system should immediately terminate power to all vehicle motor systems when activated. A kill switch for this purpose will be provided by GSU's CEC and must be used for the vehicle.
13. The overall dimensions of the vehicle must be within a 4.5' height including the driver and must fit through a 3' (width) by 10.5" (depth) by 7' (height) door to access the venue for the competition.
14. The competition will consist of an incline/sprint race, a maneuvering course, a tug-of-war, an engineering poster presentation, and an engineering journal evaluation.
15. Each team must make a towing connection mounted between 9 and 15 inches off the ground that will accept a 5/16" clevis slip hook. The hook will be provided by GSU's CEC. Vehicles that do not keep all wheels on the ground during the tug-of-war or that do not have a mount with a hook between 9 and 15 inches will be disqualified from winning the tug-of-war event.



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16. A progress update (150-250 words) must be completed at least once every two weeks and submitted by each team to chris.williams@armstrong.edu by 5 pm on Fridays starting on February 16, 2018 and ending on April 14, 2018. These updates should clearly indicate the school they are being submitted from. These progress updates should be used to help populate the Engineering Journal along with the normal journal entries. Each update will receive 5/25 points with 1 entry per week maximum allowed. Note that these progress reports will be evaluated and collectively worth 25% of the total points allocated towards the Engineering Journal.
17. The vehicle must be able to climb up and go down an 18-inch high ramp sloped at 20 degrees when running the incline/sprint-to-stop portion. See the course diagram for ramp dimensions.
18. Judging criteria will be based on:
 - Clarity and organization of the engineering journal (20%)
 - Clarity and organization of the engineering poster and its presentation (20%)
 - Performance in the racing competitions:
 - Incline/Sprint-to-Stop (20%),
 - Maneuvering Course (20%) and
 - Tug of War (20%)

Race Details

Changes to the go-kart are not allowed once the competition has started except gearing/chain changes between races (not during). However, broken components can be replaced with like kind as needed between races. If this occurs during the incline/sprint-to-stop race, the team will be allowed to make repairs, but the race will not be restarted/rerun. If this occurs during the maneuvering course, the team will be allowed 15 minutes to make the necessary repairs and rerun the course. If repairs are needed during the tug-of-war, the team will be disqualified.

Incline/Sprint-to-Stop Race

The 15-meter incline/sprint to stop race will take place indoors on a smooth hard surface. All race times will be based on the time it takes the vehicle to climb the inclined ramp, travel 15 meters towards a flag, retrieve the flag, and travel back 15 meters towards the finish line. There will be a line 10 meters past the finish line. If you cross this second line you will be penalized. Spotters will be used for the ramp portion of the course for safety. All wheels of the vehicle must be on the ground when on the ramp.



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Maneuvering Course

The maneuvering course will take place indoors on a smooth hard surface. It will include maneuvering around cones. See the course diagram at the end of this document for details. A penalty of 10% will be used to compute the score for each instance a cone is displaced by a vehicle. A 15% penalty will be used to compute the score for each instance of inadvertently missing a course feature. Actions to intentionally miss a feature will result in a minimum of 25% penalty being used to compute the score or disqualification from the maneuvering event.

Tug-of-War

Sets of two teams will be randomly selected to compete in a double-elimination tug-of-war. This will take place indoors on a smooth surface consisting of a layer of foam material with plywood on top. The two vehicles will be connected to each other via a chain attached to the mounted hooks on each vehicle. The vehicles must each attempt to tow the other across the finish line in the middle. A maximum time limit of 2 minutes will be used for each set. All wheels must be on the ground during the tug-of-war. If any of the wheels are off the ground during the tug-of-war the team will be disqualified from the tug-of-war competition e.g. teams may not attempt to "bounce" their vehicle to gain an advantage. The tug-of-war will operate as a double elimination tournament-style event.

Please address any questions and/or clarifications on these rules directly to the Dr. Cameron Coates via email at Cameron.Coates@armstrong.edu.

Further details about EDC are posted on the website: <http://engineering.armstrong.edu/edc>.

Last updated: February 2, 2018

Detailed Course Schematics are provided separately on the website.