1. **DESCRIPTION:** Prior to the competition, the contestants will design and build a mechathlete, mechanical athlete, capable of performing 5 physical tasks.

**A TEAM OF UP TO:** 2 **IMPOUND:** Yes **APPROXIMATE TIME:** 35 minutes

2. **CONSTRUCTION PARAMETERS:**
   a. The mechathlete may be made of any material, have a mass not to exceed 1.5 kg, and fit into a box with inside dimensions of 30 cm x 30 cm x 30 cm at the start of each task. The mechathlete must not modify or damage the event surface.
   
b. Commercial batteries, not exceeding 14.4 volts as labeled, may be used to energize each of the mechathlete electrical circuits. Multiple batteries may be connected in series or parallel as long as the expected voltage output across any points does not exceed 14.4 volts as calculated using their labeled voltage. Teams must be able to show the Event Supervisors the labeled voltage. While batteries containing lithium or lead are prohibited, NiCad and NiMH batteries which may contain small amounts of lithium are still permitted for use. Battery use must follow the Battery Policy at www.soinc.org.
   
c. Brushless motors, unless they are an integral part of or embedded into commercially available fans used for cooling electronics or computers, and compressed air are not permitted as components of the mechathlete.
   
d. Components may be purchased or made by the team members. Electronic components are allowed.
   
e. Modifications or adjustments may be made to the mechathletes between different tasks. Components and functions of the mechathlete may be disconnected, or disabled, for tasks in which they are not used; however, no parts may be physical removed or taken off the mechathlete. Additionally, no parts may be added to the mechathlete. All parts of the mechathlete **attached** at Impound must **remain attached** as the mechathlete completes all tasks. **No new parts may be added after Impound. Any parts that fall off the mechathlete once the competition starts will be considered a competition violation.**
   
f. The mechathlete may not be remote, or externally, controlled. Microcontrollers (i.e. TI Innovator, Raspberry Pi, Arduino, LEGO® Brick), are permitted but mechathlete size and weight requirements still apply. The device maybe connected to a laptop, or other handheld device, powered by battery that functions as a display or programming interface device
   
g. The mechathlete, and any associated elements, must function on an independent power supply. No element can be plugged into an electrical outlet at any time during the competition.
   
h. The participants must initiate each task by actuating some sort of switch/release mechanism on the mechathlete in a manner that does not contribute energy to assist in performing the task. Relying on inserting batteries or twisting wires together to start is not allowed. A stopping system is recommended.

3. **THE COMPETITION:**
   a. The Tasks required to be performed by the mechathlete are:
      
i. **Weight Lift:** The mechathlete must lift a 500-gm weight to height of between 50 cm and 80 cm and hold it for at least 5 seconds but no longer than 10 seconds. The mechathlete must then return the mass safely to the ground. **Any mass dropped uncontrolled to the ground will be considered a competition violation.** The places will be awarded based on the maximum height and duration of the lift.
      
   ii. **Sprint:** The mechathlete from a standing start must travel down a 10 m long and 2 m wide track in the shortest time possible. Additionally, the mechathlete must on its own come to a complete and full stop within 3 m of the 10-m end line. **A mechathlete traveling more than 3 m past the end line will be considered a competition violation.** The places will be determined based on the shortest timed run.
iii. Hill Climb: The mechathlete from a standing start must climb a 2-m long “hill” with a pitch of 40 degrees and stop upon reaching the top; or else go over the edge. The places will be determined based on the height of the hill that the mechathletes are able to reach with the time it takes to reach the maximum height used as a tie breaker. Any mechathlete going over the edge will be considered a competition violation.

iv. Shot Putt: The mechathlete must use an elastic solid to propel a shot putt (i.e., standard racquet ball) supplied by the event supervisor as far as possible. The places will be determined by the distance traveled by the shot putt. The shot putt must stay within the marked boundary, an arc of 45 degrees. Any shot traveling outside of this arc will be considered a competition violation.

v. Long Jump: The mechathlete will be placed 1 m in front of the launch ramp with its front against a 2x4 placed on edge. Once the mechathlete is positioned the 2x4 will be removed by the event supervisor. Then the mechathlete may be activated and being its run towards and up a 1-m ramp set at 20 degrees to make its jump. The mechathlete must come to a complete stop within 1 m upon landing. A mechathlete traveling more than 1 m after landing will be considered a competition violation. The places will be determined based on the straight-line distance from end of the ramp to where the mechathlete initially lands.

b. The tasks may be attempted once in any order.

c. Regional and State tournaments may offer fewer than 5 tasks or permit multiple attempts for each task. Teams must be notified before the tournament of the approach that will be taken at the given tournament.

d. Participants may leave the competition area between tasks, but their mechathlete must remain in the area once they have started to compete.

4. SCORING:

a. Task Scoring:
   i. Teams will be awarded points for each task equal to their place in that task.
   ii. Teams that are tied for a task, after all tie breakers have been applied, will receive points equal to the place for which they are tied and the next place(s) will be skipped.
   iii. Teams that receive a competition violation for any task will be ranked behind those that receive no competition violations for that task regardless of their overall performance.
   iv. The scoring of teams with competition violations for a task will be based on a given team’s performance compared against the performance of other teams with competition violations.
   v. If a mechathlete attempts, but is unable to complete a task, the team will be awarded points equal to the number of teams that attempted the task plus 1.
   vi. Teams that do not attempt a task will receive points equal to the number of teams that participated in the event plus 1.

b. Event Scoring:
   i. The teams overall score for the event will be the sum of the scores for the individual tasks.
   ii. The lowest score wins.
   iii. Ties will be broken as follows:
       (1) by comparing the number of competition violations between teams;
       (2) by comparing individual task scores (e.g.; team with more 1st places than 2nd places); and,
       (3) by comparing the task scores will in the order in which they are listed in the rules.