October 2023

The Rules of the Collegiate Robotic Football Fall Combine

This document sets forth rules of the Collegiate Robotic Football Fall Combine. These rules are subject to change in accordance with the evolution of the competition.

The 2023 event will be hosted at the University of Notre Dame's Stepan Center on Saturday, November 11th from 10 am to noon There will be an hour and a half lunch and networking event immediately following the Combine, after which an hour long optional event will be run known as the Oklahoma Drill Tournament. A summary of the Events is provided on the next page, and the Rules can be found afterwards.

TITLE	POSITION	TESTS
1. Speed test	WR, RB, & D	Pure speed
2. Three-Cone Drill	WR, RB, & D	Agility, maneuverability
3. Strength Test	C & D	Strength and power
4. Shuttle Run	WR, RB, & D	Speed and control
5. QB Accuracy Test	QB, C, & WR	Throwing precision/accuracy
6. Longest Pass	Quarterback	Deep throw
7. Longest Field Goal	Kicker	How far kicker can kick accurately
Oklahoma Drill Tournament (Optional)	*Any 3*	*Running, blocking, tackling*

Every Robot & Driver combination completes the Combine events based on the position for which they are submitted. The Fall Combine will feature a more individualized design which tests the holistic nature of the robotic roster and human driver roster of a team. A Robot cannot be listed at more than one position; however Drivers can be used more than once. If a Robot breaks down a different Robot can be submitted after the deadline or partway through the competition; however, the scores will not be combined for the 2 Robots. Only 1 Robot's scores will be counted across all categories per position, and the Robot to count will be decided by the team competing prior to the end of the last scored event. Teams must submit a Robot & Driver for each of the following positions in the format of this table by November 11th at 9:00 am Eastern.

POSITION	ROBOT NAME	DRIVER NAME
QB - Quarterback		
C - Center		
RB - Running Back		
WR - Wide Receiver		
D - Defensive Player		
K - Kicker		

A. **General**
   1. The Fall Combine will consist of 7 Main Events and 1 Optional Event. *(See Fall Combine Events Appendix for further details)*
      a. Speed Test
      b. Strength Test
      c. 3 Cone Drill
      d. Shuttle Run
      e. QB Accuracy Test
      f. QB Longest Pass
      g. Longest Field Goal
      h. Oklahoma Drill Practice
         1. This event is an Optional Event
         2. (This event does not count towards any seeding, the Combine Championship or any prizes)
   2. Teams will be encouraged to compete in person, but will be permitted to compete virtually if necessary. *(Further details in Section D)*
   3. The 7 Events will be run in 3 phases with the events in each phase running simultaneously. Teams will be expected to organize themselves to get their eligible robots for all 3 attempts at the events for which they are signed up.
      a. Phase 1
         1. 3 Cone Drill
         2. Shuttle Run
      b. Phase 2
         1. Strength Test
         2. QB Accuracy Test
      c. Phase 3
         1. Speed Test
         2. QB Longest Pass
         3. Longest Field Goal
   4. There will be a 35 minute time limit for each Phase with 5 minutes of transition time between Phases.

B. **Prizes**
   1. Fall Combine Championship Award
      a. The team ranked the highest across all Events (swim meet rules) will be crowned the Fall Combine Champion and awarded with the Fall Combine Championship Award.
         1. If a tie occurs, it will be broken by the team with the better score in the Quarterback Rankings.
            a. If there is still a tie, performance of each position will be assessed according to the following priority:
               i. Running Back
               ii. Wide Receiver

iii. Defender
iv. Center
v. Kicker

b. If still tied move to the next position, if still tied after all positions are exhausted, flip a coin

b. Only the best score from each event will be considered.

2. Positional Champions Awards
   a. An award will be given to the best robot at each position.
      1. There will be an award for each Positional Champion of the Virtual League separate from the main award. *(Further details in Section D)*
   b. The robot ranked the highest across all eligible Events (swim meet rules) will win this Positional Champion Awards.
      1. If a tie occurs, it will be broken by the team with the better score in the applicable drill for their position.
         a. The performance of each drill will be assessed according to the following priority:
            i. QB Accuracy Test
            ii. Longest Pass
            iii. Three-Cone Drill
            iv. Shuttle Run
            v. Speed Test
            vi. Strength Test
            vii. Longest Field Goal
         b. If still tied move to the next applicable drill, if still tied after all drills are exhausted, flip a coin
   c. Robots can only be entered as one position prior to the event.
   d. Position eligible Events are listed below:
      1. Quarterback
         a. QB Accuracy Test
         b. QB Longest Pass
      2. Running Back
         a. Speed Test
         b. 3-Cone Drill
         c. Shuttle Run
      3. Wide Receiver
         a. Speed Test
         b. 3-Cone Drill
         c. Shuttle Run
         d. QB Accuracy Test
      4. Center
         a. Strength Test

        b. QB Accuracy Test
    5. Defensive Player
        a. Strength Test
        b. Speed Test
        c. 3-Cone Drill
        d. Shuttle Run
    6. Kicker
        a. Longest Field Goal

C. **National Championship Tournament Seeding**
    1. Seeding for the National Championship in April will be determined at this Fall Combine by the aggregate of scores across several events using the swim meet system of ranking.
        a. This Combine also serves as the qualifier for the National Championship Tournament. A non-zero score is required in each event to qualify, but winning an event is not necessary. Any team who played in last season's Tournament does not need to re-qualify for this season's Tournament. Re-qualification is only needed if there's a gap year in participation or a team shows up for the previous year's Tournament without a full set of robots to field 8 of them.
    2. Due to the fact that both Virtual League and Physical League teams must compete equally for Playoff Seeding, there are only certain scores that factor into Playoff Seeding separate from other prizes *(See Fall Combine Events Appendix for further details)*. They are as follows:
        a. Speed Test
        b. 3 Cone Drill
        c. Shuttle Run
        d. QB Accuracy Test
        e. QB Longest Pass
        f. Longest Field Goal
    3. Playoff seeding will be determined among teams eligible to compete in the Tournament with the top seed being given according to the top ordinal ranking for these six events (swim meet rules).
        a. If a tie occurs, it will be broken by the team with the better score in the Quarterback Rankings.
            1. If there is still a tie, performance of each position will be assessed according to the following priority:
                a. Running Back
                b. Wide Receiver
                c. Defender

        d. Center
        e. Kicker
    2. If still tied move to the next position, if still tied after all positions are exhausted, flip a coin

D. **Hybrid Nature**
    1. The Combine will consist of two leagues: the Physical League and the Virtual League.
    2. Playoff seeding is unaffected by which League a team is admitted into.
    3. Physical League
        a. All teams who attend in person are admitted to the Physical League.
        b. Teams in the Physical League are eligible to compete for Tournament seeding, the Combine Championship Award, Positional Champions Awards.
    4. Virtual League
        a. All teams who Zoom into the event are admitted to the Virtual League.
        b. Teams in the Virtual League are not eligible to compete for the Combine Championship Award; however, they are eligible to compete for Tournament seeding, Virtual League Positional Champions Awards.

Fall Combine Events Appendix

This document sets forth rules guiding the Events of the Collegiate Robotic Football Fall Combine. These rules are subject to change in accordance with the evolution of the competition.

#1 Drill: Speed Test

Purpose: This drill measures pure speed.

Equipment: Floor tape; however, a barrier to prevent a failure to decelerate after crossing the finish line may be necessary, depending on available space.

Description: A robot runs the length of a 60-foot lane and is timed, starting from a dead stop. There is no penalty for deviating from the lane or a straight line, as the recorded time will necessarily reflect any departure from a straight line, but safety concerns demand that the lane and the area around it be kept clear during this event.

Measurement: The time in seconds taken to run the lane from start to finish.

Record:

School	Robot #/Name	Driver Name	Time (secs)
1			
2			
3			

#2 Drill: Three-Cone Drill

Purpose: This drill tests the maneuverability and agility of the robot

Equipment Needed: Three large orange cones, floor tape

Description: As in an NFL combine, this drill consists of 3 cones in an L-shape and spaced 15 feet apart center-to-center. The robots start and finish on either side of cone #1. See figure 2 for the path around the cones (the path shown is illustrative and approximate). The robot will start from rest at cone #1 with its leading edge just behind the start line. The path is timed from when the robot begins to cross the start line to when its leading edge crosses the finish line. A successful path is one that negotiates a nearly 360° turn (cone #2), a 180° turn (cone #3), and a roughly 90° turn (cone #2).

Measurement: The time required, in seconds, to travel from the start cone along the path in Figure 2 to the finish line, with one second added for each time the robot touches a cone with any part of its surface. Officials or teammates replace hit cones as needed.

Record:

School	Robot #/Name	Driver Name	Time (secs)	Penalties +1 pt/cone hit	Score
1					
2					
3					

#3 Drill: Strength Test

Purpose: This drill tests the overall strength of the robot, similar to a bench press.

Equipment: A dummy robot lineman (no motor) on coasters, floor tape. The dummy robot has a pole in the center around which weights (like those used in gyms) are placed to add mass and therefore inertia.

Description: The robot will start from rest in contact with a chosen weight on a dummy robot with three free-spinning wheels. Without using momentum, the robot must overcome the dummy robot's inertia and push it a distance of 10 feet. If the robot fails to move the stack across the finish line, they earn a score of zero and lose that attempt. The robot must start from rest in contact with the dummy robot to take momentum out of the test. See Figure 3 for a diagram. The robot does not have to follow a straight line, but the weights may or may not be ideally symmetrical on the dummy robot, so control is a factor. For each of the attempts the team can choose how much weight is placed on the chassis.

Measurement: The highest weight in pounds that can be negotiated across the finish line within 3 attempts.

Record:

School	Robot #/Name	Driver Name	Weight (lbs)
1			
2			
3			

#4 Drill: Shuttle Run

Purpose: Measure the ability of the robot to shuttle (reverse direction) in a controlled but speedy manner.

Equipment Required: 30 small orange cones, floor tape

Description: The drill consists of a start line and a finish line halfway in a rectangle 3 x 30 feet. (See Figure 1.) A straight line, marked by tape, is placed 15' from either end, marking the start and finish line. Starting from a standing stop, the robot must shuttle to one end, reverse direction, move to the other end, reverse direction again, and cross the finish line. The time to perform that action shall be measured in seconds. The timing official will measure the time and count the number of times the robot touches either side boundary line (called an infraction). One second shall be added for each infraction.

A run is immediately disqualified if the robot exits the area between the two lines of cones and doesn't immediately return. A minimum of three runs is required to register a score. Only the best score is kept.

Measurement: The time taken to shuttle from the starting line to the finish line in the lane.

Record:

School	Robot #/Name	Driver Name	Time (secs)	Penalties +1 pt/cone hit	Score
1					
2					
3					

#5 Drill: QB Accuracy Test

Purpose: This drill tests how accurately the Quarterback can throw to a specific location, how consistently the Center can snap the ball, and how effectively the Wide Receiver can retain a pass.

Equipment: Floor tape

Description: Nine "X" marks are placed on the floor at distances of 6, 12, and 18 feet and at roughly 45 degrees from a line where the QB is stationed. The Center is on the other side of the line in position to hand off to the QB. The WR is maneuvered remotely so that it sits over an "X". The quarterback passes to the wide receiver. If the football hits any part of the receiver but is not caught, the QB is awarded 1, 2, or 3 points for 6', 12', or 18', respectively. The score is doubled (2, 4, or 6 points, respectively) if the wide receiver truly catches and retains the ball. No points are awarded for a miss. If the Center is inoperable, or missing, the scoring is halved. Once a catch or touch-catch is made, the WR must move to another "X" **and no "X" may be repeated until a non-zero score is achieved for each "X".** There are 2 total minutes allotted for the players to score as many points as possible. See Figure 5 for a diagram of the drill. If a completed pass is accomplished for each "X", the team may start again at any "X" for additional points.

Measurement for Quarterback: The accumulated scores for completed passes in the time allotted.

School	Robot #/Name	Driver Name	Points 1-short; 2-med; 3-long	Halved if hand-fed	Score
1					
2					
3					

Measurement for Center: The total number of successful snaps divided by the total number of snaps as a percentage. A successful snap is defined as a snap that leads to the Quarterback passing the ball. If the Quarterback is unable to pass the ball after the snap due to the failure of the Center or the placement of the ball, that is considered an unsuccessful snap.

School	Robot #/Name	Driver Name	Successful Snaps	Total Snaps	Percent Score
1					
2					
3					

Measurement for Wide Receiver: The total number of retentions divided by the total number of touch catches as a percentage. A retention is defined by the WR possessing the ball after the ball has come to a stop. A touch catch is any pass that makes contact with the WR. This will measure how effectively the WR design can retain passes.

School	Robot #/Name	Driver Name	Retentions	Touch Catches	Percent Score
1					
2					
3					

#6 Drill: QB Longest Throw

Purpose: This drill tests the throwing strength of a Quarterback.

Equipment: Floor tape, measuring tape

Description: The Quarterback lines up at the line of scrimmage as defined by the floor tape. Each throw should be measured and recorded.

Measurement: Measure the distance from the line of scrimmage perpendicularly to the spot where the ball contacted the ground. The drill is executed three times and the highest score is considered.

Record:

School	Robot # / Name	Driver Name	Distance (ft)
1			
2			
3			

#7 Drill: Longest Field Goal

Purpose: This drill tests the furthest distance a kicker can kick a field goal

Equipment: A single set of goal posts; sufficiently long measuring device

Description: The kicker lines up at the distance of the operator's choosing from the field goal posts. Each successful kick that passes through the uprights should be measured and recorded.

Measurement: The distance from the ball's placement in or in front of the kicker and the goal post as measured along the floor perpendicular to the goal posts. Furthest completed distance is kept of the 3 attempts.

Record:

School	Robot # / Name	Driver Name	Distance (ft)
1			
2			
3			

#8 **Experiment**: Oklahoma Drill Tournament

Purpose: This drill tests the ability of a small team to block, run the football, shed blocks and tackle. As an experiment, it will not contribute to the overall Combine scoring.

Equipment: Floor tape, Coin

Description: The inspiration for this event is the "Oklahoma Drill" designed by the University of Oklahoma Sooners football team. This event operates in the format of a tournament including all teams admitted to the Physical League, one Player must be equipped with a tackle sensor and must be capable of carrying the football. The playing field is defined by the lane of an NCAA basketball court. The Line of Scrimmage is the baseline of the court and the Goal Line is the free throw line. The Offense can place two Offensive Linemen anywhere along the Line of Scrimmage with the Running Back positioned anywhere the Offense desires behind the Line of Scrimmage. The Defense can place two Defensive Linemen anywhere along the Line of Scrimmage with the Defensive Back positioned anywhere behind the Line of Scrimmage. The football begins in the possession of the Running Back.

A coin toss is managed by the referee and called by the Visiting Team. The winner of the coin toss can choose to go on Offense or Defense first. Play begins on the referee's whistle, after which all players can begin to move. The goal of the Offense is to score a point by crossing the Goal Line (free throw line) without getting tackled or stepping out of bounds (sides of the free throw lane). The goal of the Defense is to prevent the Offense from crossing the Goal Line. The game consists of 3 Offensive possessions for each team alternating between which team is on Offense. A Round consists of each team having 1 Offensive attempt. Crossing the Goal Line counts for 1 point to the Offense. The team with the most points after 3 Rounds wins. If there is a tie, the teams will flip a coin in the same manner as the start of the game. They will then continue to play Rounds in a similar manner to NCAAF Overtime Rules. This means that if a team has the lead after any successive Round they will win the game.

Teams will compete in a round-robin format playing every other eligible team once to establish rankings. They will then finish with a single-elimination tournament to determine the winner and overall standings for the drill. Any Robots regardless of position can be played in this competition and subbed in and out as the team pleases.

Record:

School	Final Standings
1	
2	
3	
4	
5	
6	
7	
8	