Battle Bots

Purpose: Competitors will demonstrate the ability to design and implement a combat robotics engineering system. Assessed skill areas include 3D design, 3D print, assembly, troubleshoot, and overall project documentation.

On-Site/Off-Site	▪ On-Site
Contest Date	▪ 4/9/2024
Contest Location	▪ Convention Center ▪ C-Hall
Early/Normal Start Time	▪ Normal Start Time ▪ Registration will open at 8:00am. Please report to B-Hall Show Office for Registration. Competition will begin at 10:00am.
Contest Open/Closed	▪ Open ▪ Exhibit Halls do not open to observers until 12:00pm.
Eligibility	▪ Schools may send team (1) team of two (2) competitors per school (Building IRN) based on local competition.
Competition Clothing (To be worn on Day 1)	Business Casual: ▪ Polo or other collared shirt ▪ Khakis or dress pants; no jeans ▪ Closed-toe dress shoes ▪ Note: Wearing socks or hose is no longer required. If worn, socks must be dress socks, and hose must be either black or skin-tone and seamless/nonpattern. ▪ Note: School identifiers and contestant names must be covered.

Safety Equipment Required	▪ Safety glasses with side shields or goggles (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles).
Awards Ceremony Attire **(To be worn on Day 2)**	SkillsUSA Official Attire: ▪ Official SkillsUSA red blazer ▪ Button-up, collared, white dress shirt (accompanied by a plain, solid black tie or SkillsUSA black tie), or white shirt (collarless or small-collared), with any collar not to extend into the lapel area of the blazer ▪ Black dress slacks or black dress skirt (knee-length at minimum) ▪ Black closed-toe dress shoes ▪ Note: Wearing socks or hose is no longer required. If worn, socks must be black dress socks, and hose must be either black or skin-tone and seamless/nonpattern Or, Business Dress: ▪ Blazer, sports coat, or dress ▪ Button-up, collared, white dress shirt (accompanied by a plain, solid black tie or SkillsUSA black tie), or white shirt (collarless or small-collared), with any collar not to extend into the lapel area of the blazer ▪ Dress slacks or dress skirt (knee-length at minimum) ▪ Closed-toe dress shoes ▪ Note: Wearing socks or hose is no longer required. If worn, socks must be black dress socks, and hose must be either black or skin-tone and seamless/nonpattern
Testing	▪ There is no written knowledge test required for this competition.
Provided by Contestant **(Tool List)**	Each student team is expected to bring the following: ▪ Robot and all internal components ▪ Transmitter ▪ Battery charger and spare batteries ▪ Various hand tools necessary for troubleshooting and repairing the robot between rounds. Suggested tools include: o Screwdriver

	- o Hex keys
	- o Pliers
	- o Hand file
	- o Extra fasteners
	- Various circuit troubleshooting tools such as:
	    - o Digital Multimeter (DMM)
	    - o Electrical tape
	    - o Soldering iron, solder, brass sponge, flux, etc.
	    - o Wire cutter/strippers
	- Small power tools as needed such as:
	    - o Dremel, drill
	- Power strip
	- 25-foot extension cord
	- Spare robot components

Contest Notes, Themes, & Deadlines	- **RULES, REGULATIONS, and SCORING RUBRICS are found HERE: SkillsUSA Competition Guide** - Each robot will compete in pool play with two matches guaranteed. The robots will be seeded for a single elimination championship bracket based on pool play performance. - If there are only 8 or less robots, then only a double elimination bracket will be used. - To be eligible to compete in the tournament, each team must submit their documentation via Dropbox at: https://www.dropbox.com/request/kV3tMneCuE4vwuKMbZmB - Judges will evaluate the journals prior to the event. - **Deadline – documentation must be submitted by 4/1/24 11:59 pm.**
Special Notes	- Starting in 2024, all State Contests will begin to add a scenario-based component. - Contact with Contest Coordinators is prohibited. Contact with Contest Coordinators outside of the SkillsUSA Ohio office may result in contestant disqualification. - All safety requirements will be heavily enforced. Violation may result in contestant disqualification. - No smart watches and/or phones are permitted during the contest and/or in contest. - No contact with anyone outside of the contest area once the contest begins.

	▪ No inappropriate communication between contestants such as verbally degrading another contest.
	▪ No cheating on any portion of the contest such as informing another contestant of the skills/test prior to competing.
	▪ Starting in 2024, Wi-Fi is provided for contests where it is required for contest success.
National Technical Standards	▪ This is a state only contest. There is no corresponding National Technical Standard for this competition.
Resume/Interview Requirement	▪ Each Battle Bots team will be required to complete a short interview. Students should be prepared to discuss their robot and defend their design decisions.
	▪ All SkillsUSA Ohio State Championship Contests will require a short interview component. Students should be prepared with basic job interview skills.
	▪ All contestants must have a hard copy of a one (1) page personal resume.

SkillsUSA Battle Bots Competition Guide

SECTION 1: Robot Construction and Functionality

1.1 Construction:
- **1.1.1** The chassis, lid, and weapon must be student designed and 3D printed.
- **1.1.2** Machined or cut parts from a block or sheet of plastic material is NOT allowed
- **1.1.3** See Materials in Section 1.2 for details on materials and their use.

1.2 Materials: Plastic Class means that the construction materials must be 3D printed plastic as described below:
- **1.2.1** PET, PETG, ABS, PLA, Tough PLA, or PLA+ are the only materials that can be used for the chassis and weapons. No other types of plastics or materials allowed (ie. metal, carbon fiber, UHMW, TPU, etc)
- **1.2.2** Motors, wheels, electronics, axles, fasteners and adhesives can be any material, but cannot be used in such a way to enhance the structural integrity, armor the robot, or enhance any weapon.
- **1.2.3** Tape and zip ties may be used internally (wire management for example) but may not be used to enhance structure of the weapon or chassis.
- **1.2.4** Competition Directors make final decisions on gray areas and have the right to reinspect any robot at any time during the tournament.

1.3 Radio System: All robots must be radio controlled with 2.4 GHz spread spectrum radio. No tethered robots allowed.

1.4 Batteries: Examples of batteries that are permitted: NiCads, NiMh, LIon, LiFe, LiPoly.

1.5 Weapons: While a variety of spinning weapons are encouraged, there are some weapon systems that are not allowed:
- **1.5.1** RF jamming
- **1.5.2** EMF fields that affect another robot's electronics
- **1.5.3** Entangling weapons (nets, tapes, strings, or other materials that entangle)
- **1.5.4** Liquids, foams, gasses, powders, sand etc
- **1.5.5** Untethered projectiles
- **1.5.6** Fire, combustibles
- **1.5.7** Light and smoke that impair the viewing of a robot
- **1.5.8** Not allowed to physically engulf your opponent

1.6 Weight: Robots must be equal to or less than the following weights:
- **1.6.1** 1.00 pounds
- **1.6.2** 16.00 ounces
- **1.6.3** 453.59 grams

1.6.4 There are NO additional weight allowances for type of movement or construction.

1.7 Safety:

1.7.1` All robots must have failsafe enabled. Failsafe means that if the robot transmitter signal is lost, the robot's weapon and driver motors will deactivate and come to a stop within 60 seconds.

1.7.2 All Robots must have a light easily visible from the outside of the robot that shows its main power is activated.

1.7.3 Name of the robot is clearly visible on the bot

1.7.4 On Match Day, robots will pass inspection (weight, materials, failsafe).

SECTION 2: Match Rules and Scoring

2.1 Match Rules:

2.1.1 Matches last 2 minutes

2.1.2 Trap door opens at one minute

2.1.3 There are two ways to win:

2.1.4 Disable, or knock-out the opposing robot. Usually that means making it so they can no longer move in the arena. If one of the robots falls or is pushed in the trap door, it counts as a knock-out.

2.1.5 Judges' decision. If a match goes the entire allotted time without one robot getting knocked out, then a panel of judges who watched the fight will decide the winner based on the scoring rubric

2.2 Match Scoring:

2.2.1 Matches will be scored by a panel of 2-3 judges using the rubric found in Section 2.2.3
   ● If only 2 judges are present the Competition Director will make the final decision on any split decisions

2.2.2 Matches will be scored on the follow criteria:
   ● Aggression
   ● Control
   ● Damage

2.2.3 Match Scoring Criteria and Rubric

2.3 Battle Scoring:

2.3.1 Battle scoring is determined by qualifying for the Championship Bracket as well as overall placement in the battle. The sum of a teams qualification points and placement points will give the total Battle points earned (Qualification Points + Placement Points = Total Battle Points). The following points will be awarded for each achievement. A scoresheet can be found below in Section 2.3.2
   ● Qualifying for the Championship Bracket
      ○ 150 points

- Fourth Place
  - 225 points
- Third Place
  - 250 points
- Second Place
  - 275 points
- First Place
  - 300 Points

2.3.2 [Battle Scoring and Scoresheet](#)

2.4 Engineering Notebook Scoring:

2.4.1 Submission of an engineering notebook that documents the work you have done is required and will be scored using the rubric found below in Section 2.4.4

2.4.2 Notebooks will be submitted and evaluated prior to the state competition in Columbus, Ohio

2.4.3 DEADLINE – documentation must be submitted by 4/1/24 11:59 pm. Submit using the link in the Competition Standards document.

2.4.4 [Engineering Notebook Criteria and Rubric](#)

2.5 Interview Scoring:

2.5.1 All teams will be interviewed during the competition and graded based on the sample questions and rubric found in Section 2.5.2

2.5.2 [Interview Sample Questions and Rubric](#)

2.6 Overall Competition Scoring:

2.6.1 A teams final score will be determined by a combination of four categories. Categories include the battle, engineering notebook, interview, and active weapon. The active weapon category is 50 points. In order to receive the active weapon points, a team must have an active weapon (i.e. spinning, lifting). A wedge robot will not receive the active weapon points. Each event carries a maximum point value as shown below. The competition scoresheet can be found below in Section 2.6.5

- Battle, 450 points
- Engineering Notebook, 400 points
- Interview, 100 points
- Active Weapon, 50 points

2.6.2 Individual scores for each category will be added to come up with the composite score.

2.6.3 If FINAL score values result in a tie, the following criteria will be used (in listed order) to determine placing:

- Knockouts For
- Knockouts Against

2.6.4 Placing will be determined by the three highest Final scores. Placing will be Gold, Silver, and Bronze with the highest Final score receiving the Gold.

2.6.5 [Competition Scoring and Scoresheet](#)

SECTION 3: Event Guidelines

3.1 Inspection:

3.1.1 All bots must pass inspection a minimum of 15 minutes before the scheduled start of the competition. Failure to pass inspection will result in disqualification and your bot will not be able to compete at the competition. In order to pass, bots must meet the following criteria:
- Pass a fail safe procedure test as laid out in Section 1.7 (All functions must stop operating when power to the radio is switched off. This includes both weapon and drive operations)
- Meet weight requirements laid out in Section 1.6
- Be constructed in a manner consistent with guidelines laid out in Section 1

3.2 Time Requirements:

3.2.1 All bots are guaranteed a minimum of 15 minutes between matches in both the qualification and championship rounds.

3.2.2 If the bot is not ready when it is time for the match, a time out must be called or the match will result in a forfeit

3.3 Time Outs:

3.3.1 Each bot is allowed ONE time out per competition regardless of round. Time outs will be 5 minutes.

3.3.2 Once the match has begun, no timeouts may be called.

3.4 Qualification Round:

3.4.1 Each robot will compete in pool play with two matches guaranteed. The robots will be seeded for a single elimination championship bracket based on pool play performance. Seeding is determined by the judges and tournament director.

3.4.2 If there are 8 or less robots, then only a double elimination bracket will be used. Seeding will be determined from the qualification round by the judges and/or the Tournament Director

3.5 Championship Bracket:

3.5.1 Winners from each qualification group will be placed into a single elimination 8 or 16 bot bracket based on the number of robots.

3.5.2 Seeding will be determined from the qualification round by the judges and/or the Competition Coordinator.

3.6 Awards:

3.6.1 The following awards will be given:
- Gold
- Silver
- Bronze
- Additional awards may be available

SkillsUSA Battle Bots Competition Scoring

A teams final score will be determined by a combination of four categories. Categories include the battle, engineering notebook, interview, and active weapon. The active weapon category is 50 points. In order to receive the active weapon points, a team must have an active weapon (i.e. spinning, lifting). A wedge robot will not receive the active weapon points. Each event carries a maximum point value as shown below:

- **Battle**
  - 450 points
- **Engineering Notebook**
  - 400 points
- **Interview**
  - 100 points
- **Active Weapon**
  - 50 points

Individual scores for each category will be added to come up with the FINAL score.

If FINAL score values result in a tie, the following criteria will be used (in listed order) to determine placing:

- Knockouts For
- Knockouts Against

Placing will be determined by the three highest Final scores. Placing will be Gold, Silver, and Bronze with the highest Final score receiving the Gold.

SkillsUSA Combat Robotics Competition Scoresheet

Team Name: _____   **School Name: _____**

Battle (450 Points)	Engineering Notebook (400 Points)	Interview (100 Points)	Active Weapon (50 Points)	Total Points

Knockouts For:_____   **Knockouts Against:_____**

SkillsUSA Battle Bots Match Scoring

This criteria covers judging for head-to-head matches for full-combat bots. If a fight does not end in a knockout or a tap out, the winner is determined by a panel of 3 judges. If a match ends early for reasons other than a knockout or tap out, (both bots not working) the judges will determine the winner of the match as if it had gone the full time.

Each judge rates the competitors across 3 categories: Aggression, Control and Damage. A judge allocates 6 points to the competitors each for Control and Damage, and 5 points for Aggression. The bot with the most points is the individual judge's choice for the winner. If there is a panel of 3 judges, the bot that is chosen by at least two judges wins the match.

All judges' decisions are final.

For example, consider a match between bots Who and Dey that goes to a panel of 3 judges:

Judge	Aggression	Control	Damage	Winner
A	Who 2, Dey 3	Who 4, Dey 2	Who 1, Dey 5	Dey 10-7
B	Who 2, Dey 3	Who 5, Dey 1	Who 2, Dey 4	Who 9-8
C	Who 2, Dey 3	Who 3, Dey 3	Who 2, Dey 4	Dey 10-7

The winner of the match would be Dey, by split decision.

Aggression

Aggression (Detailed Explanations)
- Aggression is the intensity and frequency of intentional attacks, preferably with an active weapon. To score points here, you need to make attacks that could conceivably affect your opponent.
- The key to aggression is attacking intensely and/or frequently with an active weapon, and an intention to affect your opponent.
- Whether the attack actually affects the opponent through damage or control is not important when scoring aggression. However, the intent to affect the opponent is important.

- For example, a bot that uses a powered lifter to attempt to tilt its opponent against the wall will score aggression points, as they are attacking with an active weapon with an intent to affect them.
- If a bot's weapon is disabled, but it is still attacking with intent, it scores fewer aggression points. For example, ramming an opponent with a disabled beater bar should score fewer aggression points than if the beater bar was working.
- If a bot attacks without intent to do damage, even with a functional weapon, it should score even fewer aggression points. For example, striking an opponent's armor repeatedly with a tapping stick would score very few to no aggression points, as there is no intent to affect the opponent. However, attempting to jam the tapping stick into an opponent's spinning weapon would score aggression points, as there is an intent to affect the opponent's weapon systems.
- If both bots have seemed to use active weapons equally as frequently, then consider how often they each used passive weapons like fixed wedges as a tiebreaker.
- If both bots hit each other with their active weapons simultaneously and one gets sent in the air, both are showing equal aggression.
- If a bot declines to engage its opponent, or is technically unable to engage for a significant period of time, it should lose aggression points. Note that a bot that drives away from contact briefly to prepare its weapon should not lose aggression points, nor should a bot that shows willingness to attack its opponent, but is circling briefly to find an opportunity.
- A bot that attacks consistently over the length of an entire match should score more aggression points than a bot that clumps all its attacks into a short duration of the match, but spends significant portions of the match not attacking.

Aggression Judging Matrix
- 5-0:
  - This bot used its active weapon to attack its opponent with intent for almost the entire match. The opponent spent almost all of the match not actively attacking with an active weapon using intent.
  - The opponent spent almost the entire match actively avoiding engagement.
- 4-1:
  - This bot frequently used its active weapon to attack its opponent with intent. The opponent occasionally used its active weapon to attack its opponent with intent.
  - This bot often used its active weapon to attack its opponent with intent, but only for part of the match. The other bot never used its active weapon to attack its opponent.
  - The opponent spent a significant portion of the match actively avoiding engagement.
- 3-2:
  - This bot used its active weapon to attack with intent slightly more than its opponent.
  - Both bots' active weapons were at least partially disabled, but this bot tried to attack more with its disabled weapon than its opponent.

○ This bot attacked consistently throughout the match with its active weapon. Its opponent bunched its attacks over a shorter period of the match, but spent long portions of the match not attacking.

Control

Control (Detailed Explanations)
- Control is how well you dictate the flow of the match. To score points here, you want to put your opponent in a bad spot, like pinning them or getting them stuck.
- The key to control is seeing your opponent put in a bad position. This could include:
    ○ Inverting them
    ○ Pinning them
    ○ Getting them stuck against the wall
    ○ Getting them stuck on a rough patch on the floor
    ○ Getting them stuck on a side that the bot was not capable of self-righting from
    ○ Getting them stuck on debris
- Pinning a bot should not count as much as leaving them in a stuck position.
- If a bot sticks itself, that counts as if it was stuck by its opponent (although see the tiebreaker rule below).
- A brief period of being stuck (e.g. getting a fork stuck in a divot for a second or two) should not count against a bot for control. A bot should be stuck long enough to affect the flow of a match in order to lose control points.
- A bot that unsticks its opponent demonstrates more control than a bot that lets the ref do the unstick. A bot that unsticks itself demonstrates more control than a bot that needs the other bot to unstick it.
- If Bot A is able to use Bot B's weapon against itself, then Bot A is considered to be showing control.
- If bots seem to control the match equally, shift your focus to each driver's control of their bot as a tiebreaker. Was a driver in control of their bot, or did they seem to frequently lose control of it? If one bot stuck itself, then the other bot should get more control points.

Control Judging Matrix
- 6-0:
    ○ This bot pushed the other bot around the cage at will, repeatedly putting them into bad situations while never itself being put in a bad situation.
    ○ The other bot got stuck far more often.
- 5-1:
    ○ This bot was able to get the other bot in bad positions in the cage several times, while it got put in bad positions occasionally, but less frequently.
    ○ The other bot got stuck somewhat more often.
- 4-2:
    ○ This bot got the other bot in bad positions slightly more often than it was put in bad positions.
    ○ The other bot got stuck slightly more often.

- ○ Both bots were stuck in bad positions about the same amount, but the other bot stuck itself in bad positions more.
- ● 3-3:
  - ○ Both bots seemed to control the match equally.
  - ○ Neither bot seemed to take control of the match.

Damage

Damage (Detailed Explanations)
- ● Damage is the condition of your opponent's bot at the end of a match compared to how it started. To score points here, you need to hurt your opponent's critical systems.
- ● Damage is the relative state of the bot at the end of a match, as compared to at the start of the match, with its weapon and drive systems assumed to be fully functional at the start of the match. The highest damage score is awarded to the complete destruction/disablement of a subsystem, followed by the reduced effectiveness of a subsystem, damage to critical structural components, damage to ablative components, and lastly aesthetic or cosmetic damage. Self-damage is weighted as being equal to damage from the opponent.
- ● If a bot's active weapon does not work from the very start of the match, or if its drive is compromised at the very start of the match, this will count as damage.
- ● To score damage points, a bot must alter the state of their opponent's bot. When scoring damage, consider this chart, where the most damage points is at the top (Level 1), and least is at the bottom (Level 6).
  - ○ Level 1: Destroying or disabling the drive system and all weapon systems on its opponent will score maximum damage points. In this case, the opponent was likely only saved from a knockout by the fight timer running out.
  - ○ Level 2: Destroying or disabling some of an opponent's drive or all its weapon systems. This includes removing a spinner's weapon belt so it no longer spins. An articulated weapon, like a hammersaw, must be completely disabled to count here; that is, both the saw and the arm must be disabled. It also means disabling an opponent's drive to the point where they can translate around the arena just enough to avoid being counted out, but not so much that they can move anywhere at will.
  - ○ Level 3: Reducing the effectiveness of an opponent's drive or weapon systems. This includes removing at least one wheel, doing enough damage to at least one wheel to make it inoperable in a way that significantly affects the bot's driving, partially disabling an articulated weapon (disabling either the saw or the arm, but not both), or cutting a flamethrower line so that the other bot sprays fire on itself. It also includes compromising an opponent's ability to drive somewhat, but not enough to initiate a count-out.
  - ○ Level 4: Doing structural damage to an opponent, like damaging its frame, doing significant damage to non-ablative armor, or damaging a wheel in a way that doesn't significantly change a bot's mobility.

- ○ Level 5: Most ablative armor removed from at least one side of the opponent, or small gouges/holes in an opponent's non-ablative armor.
  - ○ Level 6: Cosmetic damage to a bot, like scratches against paint. Or, some ablative armor removed.
- Ablative armor is any non-structural component intended solely to absorb damage by being consumed.
- Running out of fuel (i.e.power from a weapons battery, pneumatic gas) does not count as damage, even though it would disable a weapon..
- In most cases, any damage done to a bot is considered damage against it, whether it was dealt by its opponent or self-inflicted. The only exception to this is if a weapon has been stopped through entangled debris in its mechanism from an opponent's ablative armor or other removed material. In that case, damage is not counted against it.

Damage Judging Matrix:
- **6-0**:
  - ○ There are at least 4 levels separating the two bots. For example, one bot is at Level 6, and the other bot is at Level 2.
- **5-1**:
  - ○ There are 3 levels separating the two bots. For example, one bot is at Level 4, and the other bot is at Level 1.
- **4-2**:
  - ○ There are no more than 2 levels separating the two bots. For example, one bot is at Level 5, and the other bot is at Level 6.
- **3-3**:
  - ○ Both bots did an equal amount of damage to each other.
  - ○ Neither bot did any damage to the other.

SkillsUSA Combat Robotics Match Rubric

Bracket # _____   Match # _____

Bot Name	Aggression (Must Total 5)	Control (Must Total 6)	Damage (Must Total 6)	Points

WINNER:_____   KnockOut:_____   Decision:_____

SkillsUSA Battle Bots Interview Rubric

Team Name:_____   **School Name:**_____

Directions: Determine the point value that best characterizes the content of the Interview for that criterion. Partial points can be awarded in 1 point increments if needed. Write the point value in the column to the right. This rubric is used for all submissions regardless of format (physical or digital).

Sample Questions: Below is a list or several questions that are similar but may or may not be the exact questions asked during the interview.

- Tell us about the subsystems (drive, weapon, chassis) of your robot.
- Tell us about the decisions that went into your 3D print settings and how those decisions impact the effectiveness of your robot design.
- Tell us about the role and contribution of each team member.
- Describe a challenge you faced and how you overcame it.

Criteria	Proficiency Level			Points
	Advanced (40-50)	**Proficient (20-30)**	**Developing (0-10)**	
Robot Design and 3D Print Process	Team can fully explain the subsystems and 3D printing process from the original design to their current robot.	Team can provide a limited description of the subsystems. Basic knowledge on 3D printing process.	Team did not explain the design or 3D print process or design is not student directed	
Teamwork, Project Management, Communication, Professionalism	Both of the team members contribute to explanations of the design process, fight strategy, project management, and other work done by the team.	One team member contributes to explanations of the design process, fight strategy, project management, and other work done by the team.	Responses not well thought out, answers not clear, or unsure of how to answer questions	
Notes:				**Total Points**

SkillsUSA Battle Bots Notebook Rubric

Team Name:_____ **School Name:**_____

Directions: Determine the point value that best characterizes the content of the Engineering Notebook for that criterion. Points should be awarded in 1 point increments if needed. Write the point value in the column to the right. This rubric is used for all submissions regardless of format (physical or digital).

Criteria	Proficiency Level			
Engineering Design Process	**Advanced (30)**	**Proficient (20)**	**Developing (10)**	**Points**
Define Problem	Identifies design challenges at the start of each design cycle with words and pictures. Clearly state the goals for accomplishing the challenge.	Identifies the challenge at the start of each design cycle. Lacks details in words, pictures, or goals.	Does not identify the challenge at the start of each design cycle.	
Generate Concepts	Lists three or more possible solutions to the challenge with labeled diagrams. Citations are provided for ideas from outside sources.	Lists one or two possible solutions to the challenge. Citations are provided for ideas from outside sources.	Does not list any concepts.	
Develop Solution	Explains why the solution was selected through testing and/or a decision matrix. Fully describes the plan to implement the solution	Explains why the solution was selected. Only mentions the plan.	Does not explain any plan or why the solution or plan was selected	
Construct and Test	Records the key steps to model and construct the solution. Includes enough detail that the reader can follow along. Solution clearly tested.	Records the key steps to model and construct the solution. Lacks sufficient details.	Does not record the key steps to model and construct the solution.	
Evaluate Solution	Evaluates the solutions. Provides details in words, or pictures to support findings. Clearly lays out next steps.	Evaluates the solution. Lacks details in words, or pictures to support findings.	Does not evaluate the solution.	
	Advanced (40-50)	**Proficient (20-30)**	**Developing (0-10)**	
CAD Drawings and Assemblies	Detailed models and assemblies of all parts with drawings. Dimensions provided where needed. Exploded views included.	Detailed models and assemblies of most parts with drawings.	No or minimal models and drawing included.	
3D Print Settings and Research	Shows understanding of the formation of structure in context to how parts were printed. Prints were optimized for design.Examples include: orientation, wall thickness, infill density and pattern, ect	Shows basic understanding. Some settings and options changed but not optimized for the design.	Understanding of 3D printing is lacking, Common or stock settings used.	
Parts and Weight List	Provides parts list with details on the parts such as vendor, cost, quantity and weight.	Provides parts list with weight. Details of individual parts lacking.	Parts list missing or has little to no details provided.	
Fight Strategy	Thoughtful strategy provided with connection to design including both written descriptions and diagrams.	Strategy lacking details or not clearly thought out.	No clear strategy provided.	
Notebook Format	Five (5) points if the notebook has evidence that documentation was done in sequence with the design process. This can take the form of dated entries with the names of contributing students included and an overall system of organization. For example, numbered pages and a table of contents with entries organized for future reference.			
Notes:				**Total Points**

SkillsUSA Battle Bots - Battle Scoring

Battle scoring is determined by qualifying for the Championship Bracket as well as overall placement in the battle. The sum of a teams qualification points and placement points will give the total Battle points earned (Qualification Points + Placement Points = Total Battle Points). The following points will be awarded for each achievement.

- **Qualifying for the Championship Bracket**
  - 150 Points
- **Fourth Place**
  - 225 Points
- **Third Place**
  - 250 Points
- **Second Place**
  - 275 Points
- **First Place**
  - 300 Points

SkillsUSA Battle Bots - Battle Scoresheet

Team Name: _____   **School Name: _____**

Championship Bracket Qualification (150 Points)	1-4 Placement (225-300 Points)	Total Points

Knockouts For:_____   **Knockouts Against:_____**