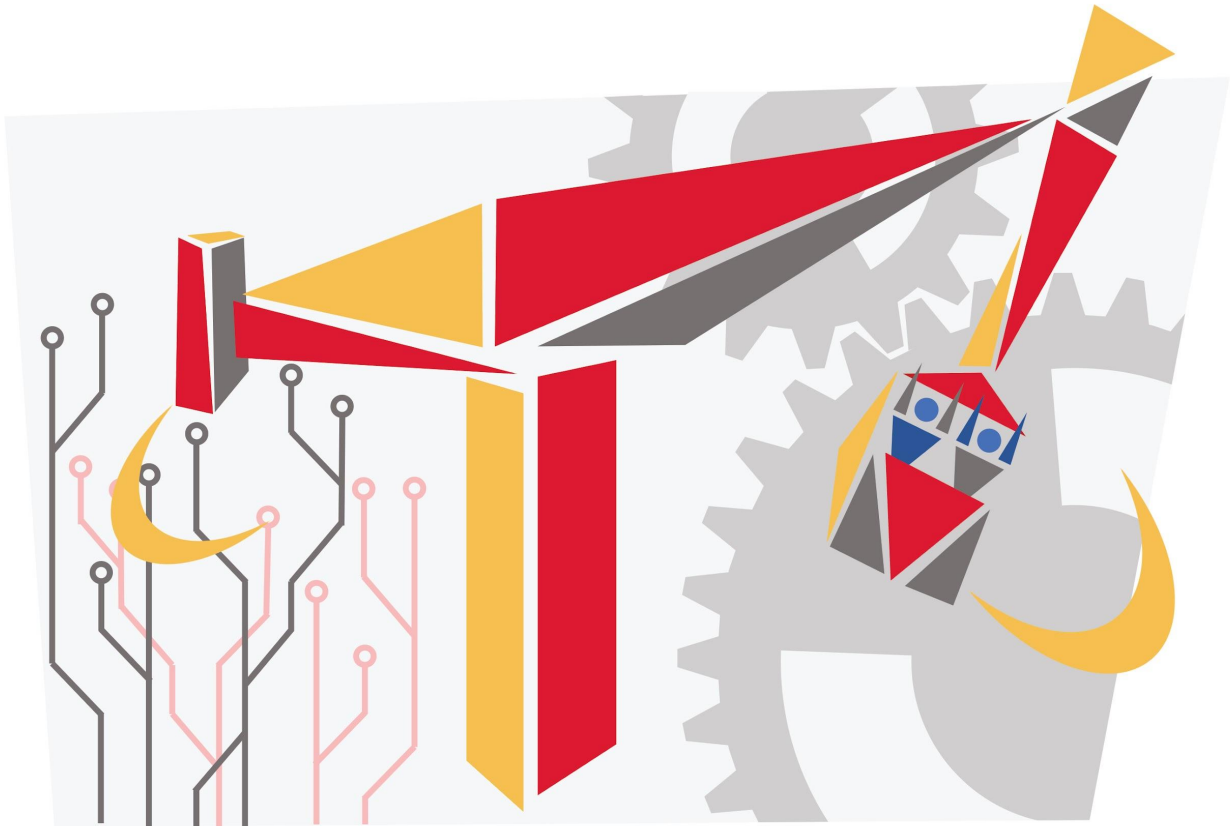


Ride Engineering Competition



Rule Book 2024

Ride Engineering Competition

Introduction and Synopsis

Rationale for the creation of this competition:

Students seeking a career in the Themed Entertainment industry have the opportunity to demonstrate their themed experience and attraction design skills in several existing competitions. These competitions often focus on Industrial Design concepts, or short term design decisions, but do not allow for a full lifecycle Systems Engineering Process. Collected data shows that most University Theme Park clubs include high concentrations of mechanical, civil, and electrical engineering students who have not participated in competitions outside the Attractions Industry.

Overview:

The Ride Engineering Competition offers students a chance to demonstrate real-world engineering practices within the industry focus of ride engineering and design. Student teams will have 6 months to design, plan, and manufacture an attraction for small candy riders based on a prompt that includes a plot of land and desired rider experience. Teams will receive points for three major deliverables: a Systems Engineering Report that details the engineering decisions and actions throughout the project, a Functional Physical Model of the attraction, and a team score for Final Presentation and Outreach. Teams will also receive point deductions for the relative cost of their ride compared to their competition.

The Competition culminates in an event featuring a 6-hour window in which all Rides must run continuously. During this time Teams will Service their rides whenever needed. Judges will award points based on the implementation of the ride and team's service preparedness, and teams will present their Ride and Engineering Process.

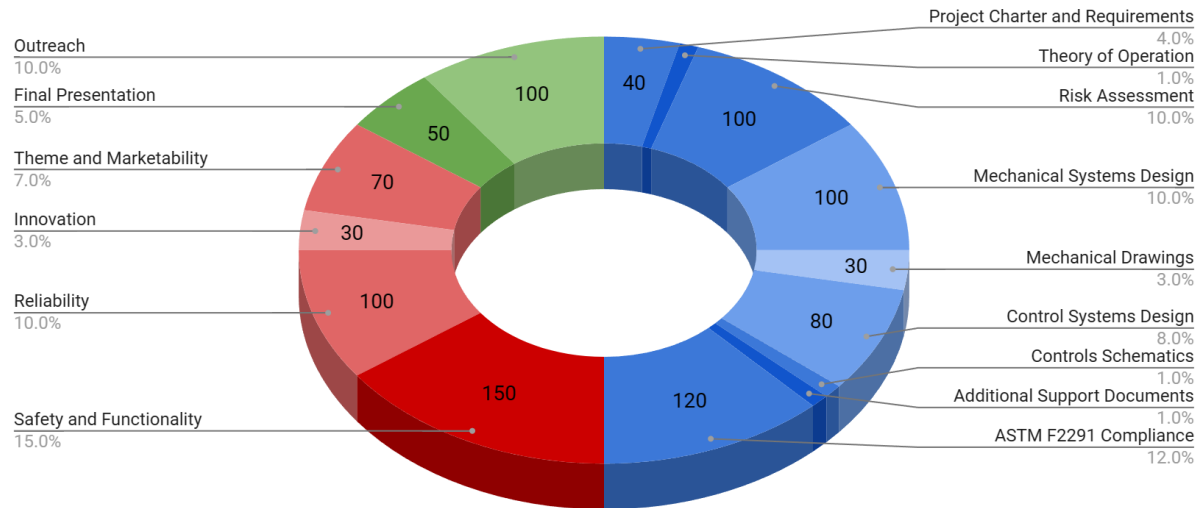
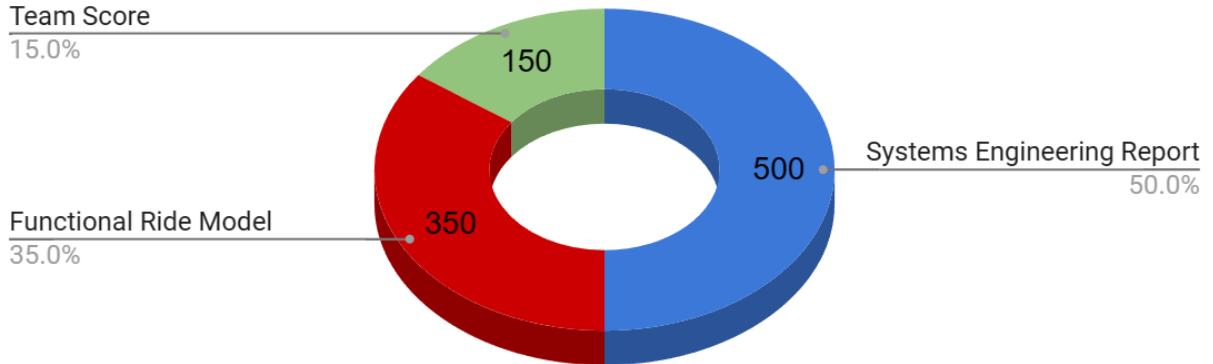
Timeline

Full Competition

- **October 28 2023:** Registration Opens and Prompt is Announced
- **December 2 2023:** Registration Closes
- **3 weeks after registration:** Initial Project Charter due
- **February 10 2024:** Preliminary Design Review
- **March 2 2024:** Final Design Review
- **March 2 2024:** Event registration due
- **April 7 2024:** Final Hand-in
- **April 10 2024:** Ride poster and Proof of Life due
- **Sat. April 13 2024:** Competition Event

Scoring

Scoring Overview



There are 1000 points up for grabs, however only 750 points are expected for teams that perform at the level of a professional ride engineering team. Additional points can be earned in each section by going above and beyond. Scoring above 500 points will be a great achievement.

For more details see the detailed Rubric at the end of the Rule Book.

Competition Events

The Competition will be held on-site on Saturday April 13th, 2024

The Day of Operation

Teams will be given time to set up their rides and prepare them for operation. Once this period is done an official shall announce the Opening of the Park. At this time, all teams will start their Rides running in automatic operation. The Park will be open for 6 hours. All Rides should continue automatic operation for this entire span of time. Teams are recommended to have 1 member present with their ride at all times, although this is not a requirement. If a judge or official notices a ride seemingly malfunctioning with no team members present, they will attempt to halt the ride and notify the Team Leader of the Downtime and observations.

Downtime

If an attraction malfunctions, Teams must service the attraction and restore it to an operating condition. It is the responsibility of the Team to prepare for these repairs. Teams may voluntarily suspend operation of their ride to service it.

All Servicing actions will be documented with a Downtime Slip detailing the circumstances that caused the downtime and the actions the Team took to resume operation. Any intervention to the ride will trigger a downtime instance.

Physical Ride Judging

During the Operation Day, groups of Judges will be meeting with teams to see their Rides in action. Judges will question the teams on their design, safety, serviceability, Innovation / Marketability, and Theme.

Teams will receive approximate times when groups of judges will visit to discuss these sections. Time is limited for these visits. Ensure that your team is prepared with any additional resources or documentation. Judges will award points in these categories based solely on this interaction, and it may be the only interaction these specific judges have with your team.

Presentations

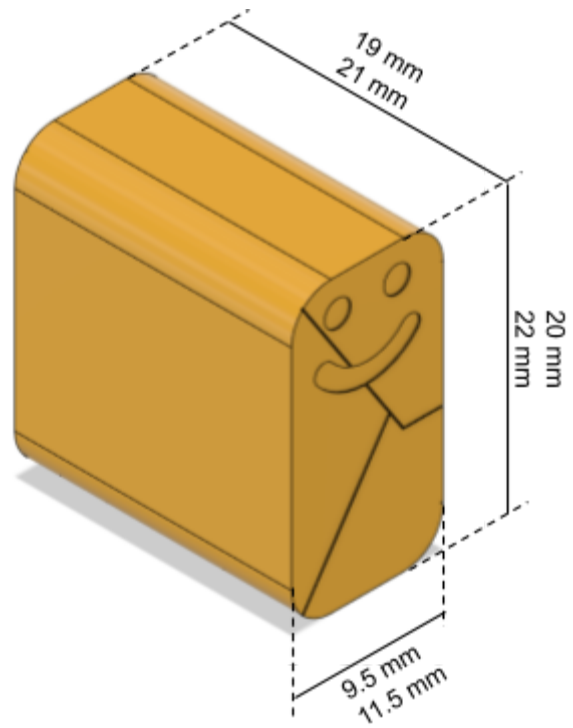
During the Operation Day, At least 2 representatives from each Team will give their Final Presentation to the Judges at a pre-assigned time. This Presentation not only yields a score for effective communication and presentation skills but also serves to exemplify and support the information presented in the Systems Engineering Report and Ride Judging. Each Presentation shall be no longer than 10 minutes, with 5 additional minutes for Questions and Answers.

Riders

The riders are approximately 1:50 the scale of a seated Adult Male Human rider. Specifically, the riders shall be a rectangular prism represented in size and weight as a common american wrapped chewy candy. These riders are not human, and should not be assumed to have human qualities unless determined by your team. The specific rider qualities determined by a team may vary between teams. Please take care to communicate your determinations in your reports.

The Riders have the following approximate dimensions:

Height	20 - 22 mm
Depth	19 - 21 mm
Width	9.5 - 11.5 mm
Weight	4.5 - 5 grams



An STL file of the rider is available from the REC Website and can be 3D Printed. Printing the file with PLA filament at 60-70% infill will create a rider of the correct size and weight.

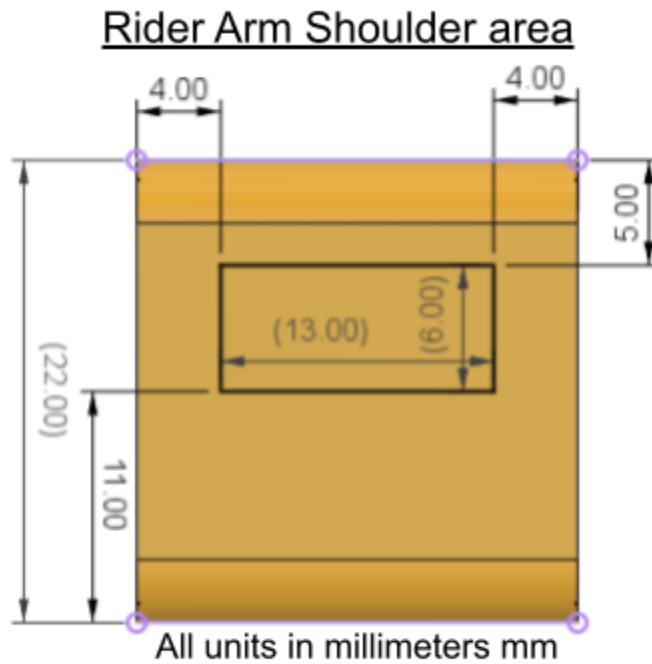
At the final event, candy riders will be provided to all teams and must be used. No 3d printed riders are allowed during the competition day.

Arm Reach:

Teams shall include in their analysis that riders have 'arms' that are 15 mm in length and can protrude from the sides of the rider in any direction, starting at a Shoulder anywhere within a rectangular area on the sides of the rider. The Shoulder area starts at half the rider's height, is 5 mm from the top and is 4 mm from the front and back as described in the following figure for a

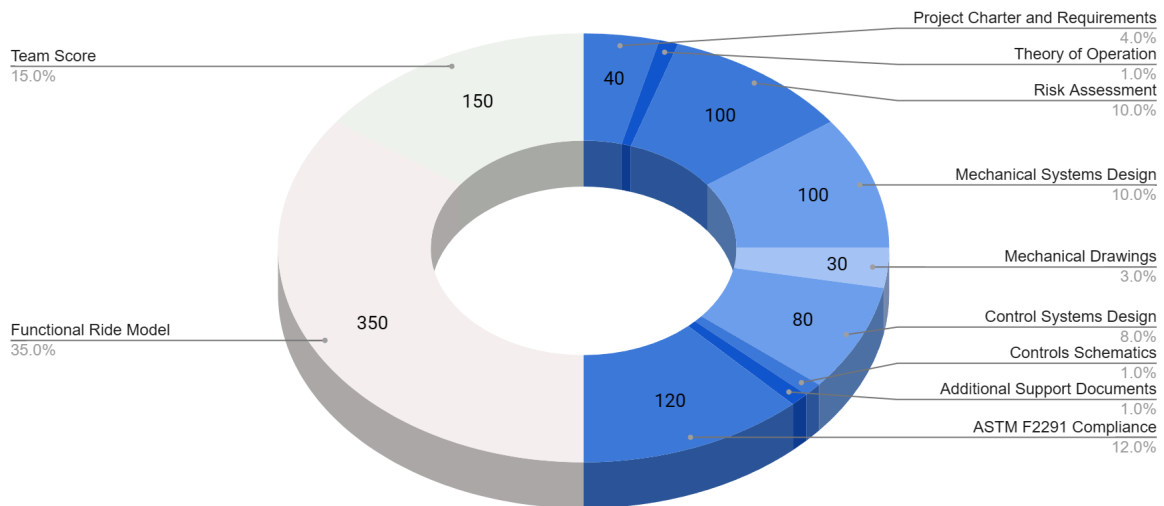
22H x 21D x 11.5W mm rider.

These 'arms' will not be represented in any physical way at the competition but shall be accounted for in the design.



Systems Engineering Report (500 pts.)

The purpose of the Systems Engineering Report is to promote a Systems Engineering approach to the challenge. The Report accounts for 50% of a team's overall score and is designed to emulate the real engineering tasks conducted by engineers in the attractions industry. The designs referred to in the report detail the ride that the team creates, and will reflect the materials, components, dimensions, and forces used in the physical ride. The required contents of the Report can be broken down as follows:



- **Project Charter and Requirements (40 pts.)**

The Project Charter is a vital part of an engineering task. The purpose of a Project Charter is to provide a framework to define the scope and desired outcome of the project. This document is to be created before any substantial engineering work is performed and must include:

- Problem Statement
 - Define the ultimate goal of the project, and the means by which that goal will be achieved. This should be written without any specific design decisions.
- Background Context and State-of-Art research
 - Gather information that may inform or inspire your team during your design process.
- Stakeholders
 - Identify all parties internal and external who will affect the project in any way. This includes the REC Planning Committee.
- Initial Resources
 - Identify the people, availability, skills, tools, funds, and opportunities you have available to your team. This will help you identify needed resources during the project.
- Scope of Work
 - Identify the deliverables, timeline, and limits of work for the project. A Gantt Chart in MS Excel or MS Project is highly recommended for creating your project timeline.
- Design Criteria and Desired Outcomes
 - Requirements from competition documents and team constraints shall be noted in as much detail as possible. Create metrics that can be used to evaluate the project during the season.

The initial Project Charter should be created before any significant development is done on the project and agreed upon by all members of the team. This tool can be used throughout the project by creating updated versions at key milestones of the project, such as Design Reviews.

Only the final Project Charter submitted with the full Systems Engineering Report will be scored for points.

Failure to submit the initial project charter will result in a 10 point deduction. If no final Project Charter (may be identical to initial project charter) is submitted alongside the Systems Engineering report, Judges may not be able to reward any points in this category.

- **Theory of Operation (10 pts.)**

The Theory of Operation is an overview of what the final ride is, and what it does. This section shall include an organized introduction to the systems and subsystems of the ride. The details of how those systems are designed shall be covered in the Mechanical Systems Design and Control Systems Design sections.

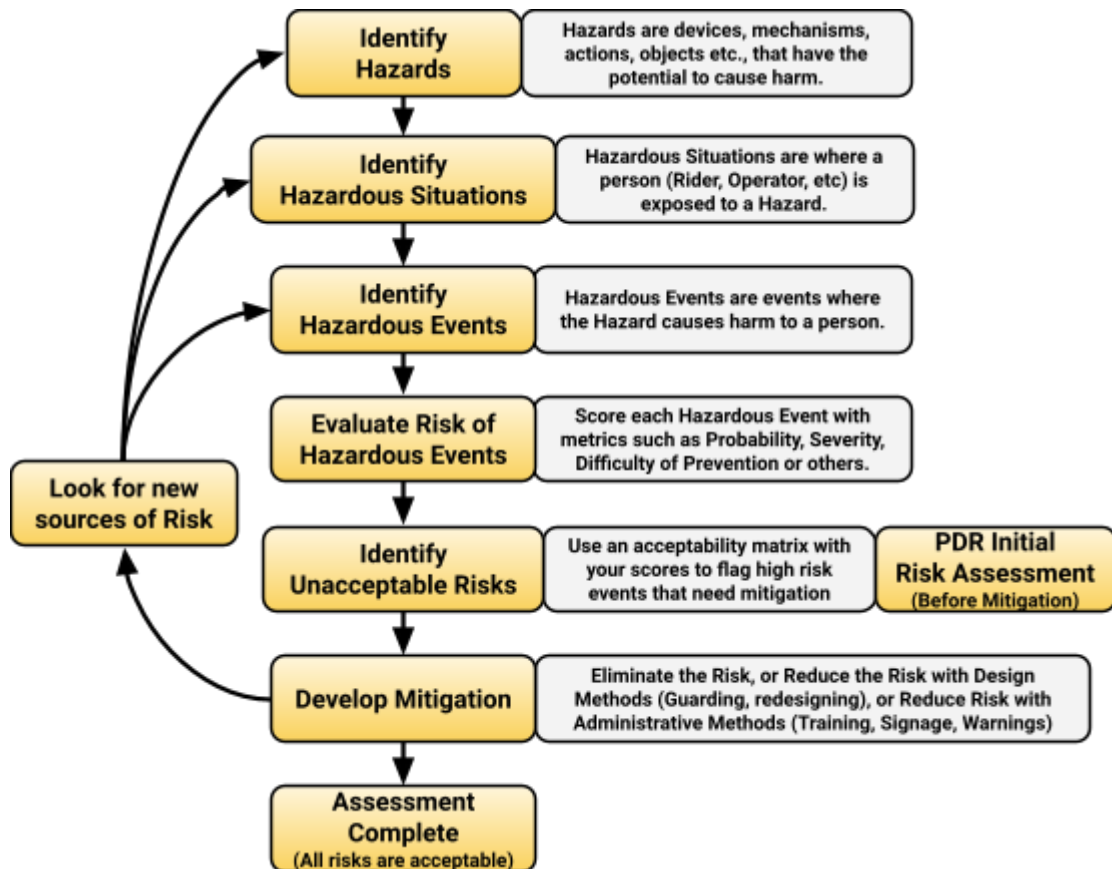
This section will also be delivered to judges at the final competition event. These judges may be different individuals than those who scored your Systems Engineering Report.

Specific points for this section are low, but previous results have shown that teams who effectively introduced their ride scored significantly higher in subsequent categories.

- **Risk Assessment (100 pts.)**

This document outlines the potential risks on People (Riders, Operators, etc.) presented by the Ride. All reasonably foreseeable hazards and risks should be identified and evaluated using criteria such as Severity and Probability, and possibly other metrics such as Exposure. Hazards determined to pose a high enough risk should be mitigated via Elimination, Design Methods, or Administrative Methods. Teams should demonstrate a thorough understanding and assessment of potential risks.

The Initial Risk Assessment shall be prepared for the Preliminary Design Review (PDR) after Identifying and scoring Risks based on the Ride Concept. Additional Risks and Mitigation methods shall be included in the final Risk Assessment section of a team’s Systems Engineering Report.



Note: What is harm to an inanimate rider? As engineers it is up to the teams to determine what they constitute as "harm" to their riders. There is no "correct" interpretation. The goal is to have sound and thorough justification for all assumptions.

Ride Engineering Competition

This year, the professional Amusement Industry risk assessment software ADVANTIS is available for free to students competing in the Ride Engineering Competition. Details on obtaining access and webinars teaching the use and methodology of the software can be found on the REC Website. Use of the software is not required.



- **Mechanical Systems Design (100 pts.)**

This section outlines the mechanical systems within the attraction and provides justification for design decisions made. This section shall include applicable Theory, Calculations, Analysis, and Decision Matrices to demonstrate that the design decisions made by the team reflect the desired outcomes defined by the Project Charter.

Please use images, drawings, and/or schematics to help communicate the mechanical systems described in this section of the report.

- **Drawings of all Mechanical Components and Systems (30 pts.)**

Engineering Drawings of all components to a consistent drawing standard (ASME Y14.100 recommended). Drawings shall include all relevant information needed to manufacture and assemble the ride mechanism.

- **Control Systems Design (80 pts.)**

This section outlines the electrical and control systems within the attraction and provides justification for design decisions made. This section shall include applicable Theory, analysis, and verification to demonstrate that the design decisions made by the team reflect the desired outcomes defined by the Project Charter. Points shall be awarded both for the hardware and software components of the overall control system.

Please use images, drawings, code, and/or schematics to help communicate the electrical and control systems described in this section of the report.

- **Schematics of all Controls and Electrical systems and Code (10 pts.)**

Schematics shall document the connections between components and specify electrical characteristics of each connection (Voltage, Protocol, etc). Programmed Code shall also be included.

- **Additional Technical Support Documents (10 pts.)**

Additional Documents that further illustrate the system such as animations, manuals, exploded views, etc.

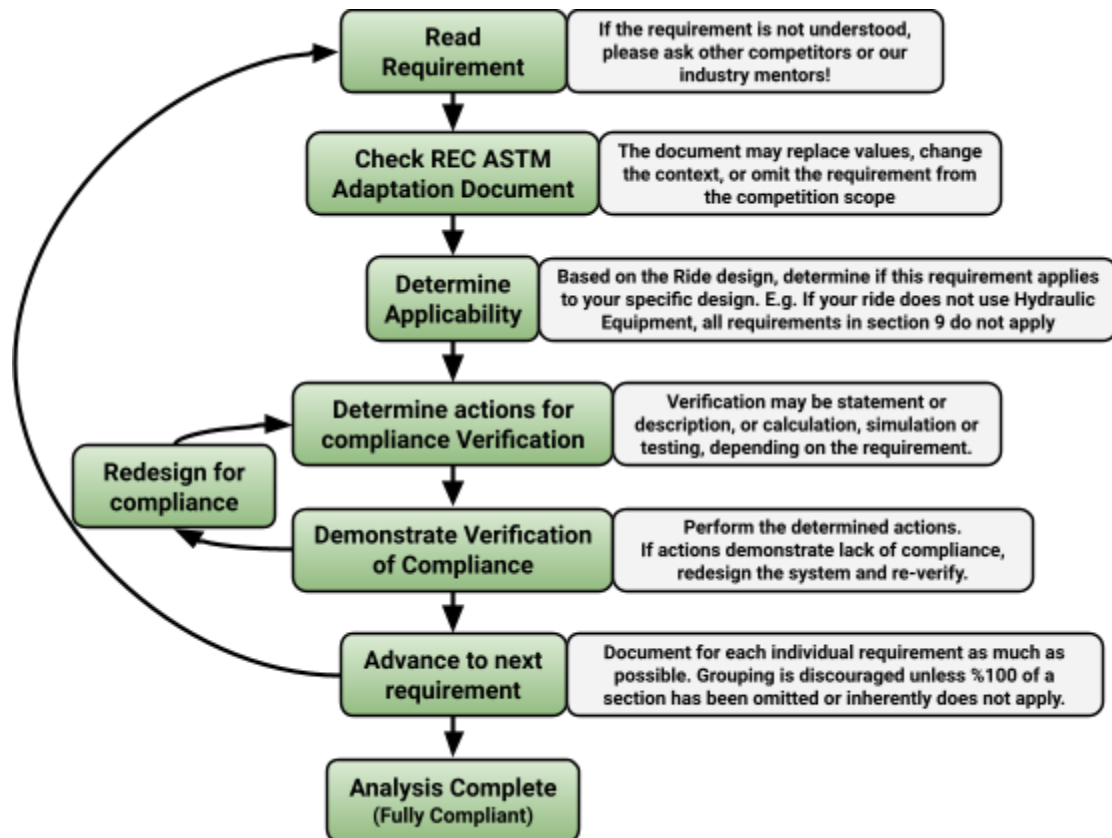
- **ASTM F24 Compliance Analysis (120 pts.)**

Teams shall demonstrate that their attractions comply with ASTM F24 standard F2291 pertaining to the Attraction Designer / Manufacturer. Teams will use the ASTM F2291 Standard along with the Ride Engineering Competition ASTM Adaptation Document providing guidance vital to compliance within the context of this competition. The REC ASTM Adaptation Document includes information on which sections do not apply within the context of the competition, as well as figures to be used in place of those in F2291. Teams are to use the Adaptation document as rationale for their compliance analysis.

E.g. Section 5.3.1.4 does not apply to this ride because the REC ASTM Adaptation Document states that section 5.3.1.4 does not apply to the Ride Engineering Competition.

Teams may demonstrate compliance with additional standards, as industry professionals are required to do, for additional points.

Teams are encouraged to take a systematic approach to identifying applicability and compliance to every requirement in F2291 with the following process:



- **Design Reviews**

Design reviews act as key components to the engineering process where the team presents their work at a milestone and receives feedback from other members of their team and external knowledgeable guests such as outside students, professors, or professionals.

During the Competition Season, Teams are required to perform 2 design reviews.

The Preliminary Design Review shall cover the initial concept for the ride and an initial risk assessment for the ride. The review may cover additional content at the discretion of the team.

The Final Design Review shall cover the final concept and design methods for the ride, empowering the team to move with confidence into the final engineering and manufacturing of the ride itself.

Teams are required to send validation to the REC that these reviews were conducted. This could be in the form of a summary, meeting minutes, a photo, the presentation, or a recording. Reviews can be conducted at any time before the deadlines.

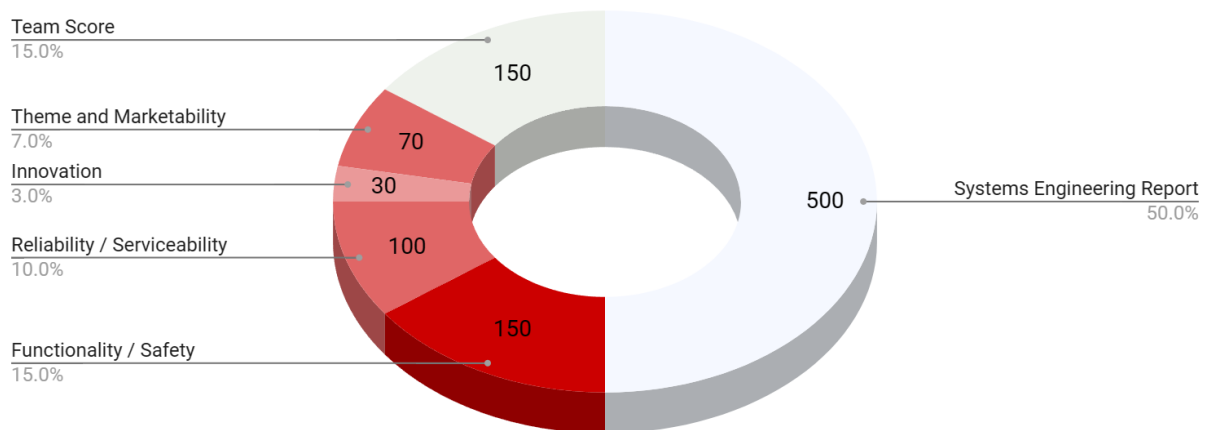
The REC will review the progress of concepts at these reviews and may contact individual teams to assist with ensuring compliance with the rules and prompt.

Physical Ride (350 pts.)

Teams will demonstrate their designs by manufacturing a functional attraction for wrapped candy Riders. The Ride shall perform the ride experience and theme of the attraction with the functional mechanical and control systems detailed in the Systems Engineering Report.

Note on rider scale: This is not a model ride. The riders of this attraction are candies as described in the Rulebook. These riders are not stand-ins for human riders. These candy riders are the real riders of this real attraction. The accelerations and forces used to engineer the ride shall be based on the actual accelerations and forces experienced by the candy riders.

The Ride will be given points during the competition day based on the following categories:



- **Functionality / Safety (150 pts.)**

Rides should function efficiently and incorporate safety features to protect guests and in the case of a malfunction. Teams shall show to judges that their ride operates safely in regard to riders. Teams will demonstrate active and passive safety functions.

Riders shall be held securely once loaded and must be capable of being unloaded easily once the safety restraint is removed. If a restraint becomes loose or undone throughout the duration of the ride sequence causing a Rider Ejection, immediate action must be taken and severe penalties shall be levied, dependent upon the incident.

No physical contact with the ride itself should be needed while in operation. Any physical contact with the ride will trigger downtime and must be reported. Safety measures should be built into the control system, including an Emergency Stop to take immediate action in the occasion a crisis emerges.

Teams will submit a Safety Report outlining safety related functions of their ride at the Final Event. Judges at the event will ask teams to demonstrate their safety functions.

- **Reliability / Serviceability (100 pts.)**

This score takes into account the Ride's ability to continuously run throughout the Park's Operating Hours. Teams will receive points for incorporating Serviceability into their design and planning for the event.

Teams will prepare a Failure Modes Analysis and Service Plan to prepare for the likely failures that may occur and the necessary service procedures required to address them.

Points will be rewarded for the percentage of time during the operation period that a ride is running. Teams can earn back points lost through effective service execution and may earn additional points than the number lost for exceptional performance.

Ride Engineering Competition

Teams will receive points for efficiently, quickly, and safely servicing their rides while striving for minimum Downtime. Points will be deducted for encountering Downtime of any form. Teams that experience no or limited Downtime, or demonstrate efficient Service Solutions when faced with an obstacle, will receive high scores.

If a ride receives catastrophic damage and becomes Standing But Not Operating at any point throughout the Operating Hours, it will not receive any additional points in this section for the remainder of the event. Teams should prepare for this and have spare parts on hand in the emergence of such an event.

- **Innovation (30 pts.)**

Ride experiences should satisfy the prompt request and be observingly fun and adventurous to an average guest by offering for example heights, spins, and/or exciting and new sensations to the rider. Rides may be any kind of experience and are allowed to be similar in form or function to existing attractions.

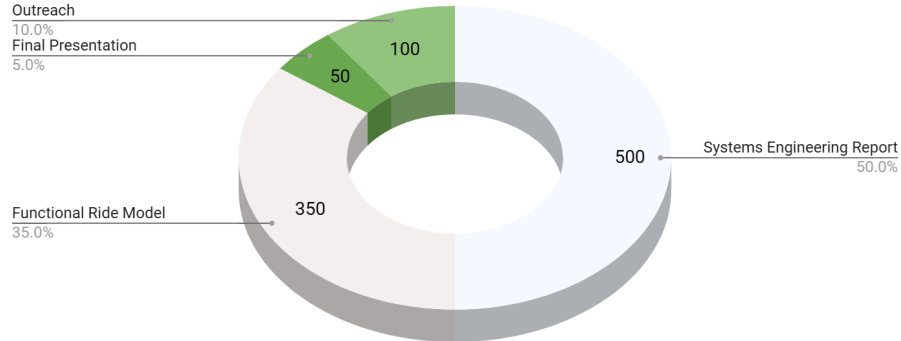
Note: Recreating existing ride products is allowed, however it is the responsibility of the team to perform all of the engineering and design work associated with their final ride. An existing ride type properly engineered to this scale will feature appropriate differences in design as a result of a systems engineering process.

- **Theme and Marketing (70 pts.)**

An effective ride theme portrays a story to guests and immerses them in an atypical environment. Teams will use theme elements such as colors, props, geometry, and any type of storytelling necessary to captivate guests and enrich the ride experience. Rides and theming should be realistic and true to scale with the rider.

An effective theme builds on the ride experience of the ride system and can be effectively marketed to potential guests. Teams shall demonstrate to judges how the theme is portrayed to riders experiencing the ride, and how it is marketed to attract new riders.

Ride Engineering Competition



Final Presentations (50 pts.)

During the Operation Day, 2-3 representatives from each Team will give their Final Presentation to the Judges at a pre-assigned time. This Presentation not only yields a score for effective communication and presentation skills but also serves to exemplify and support the information presented in the Systems Engineering Report and Ride Judging. Each Presentation shall be no longer than 10 minutes, with 5 additional minutes for Questions and Answers.

Presentations will take place in a meeting room away from the competition floor. Teams may not bring their ride to the presentation itself.

Teams will also create a 24" x 36" Poster, 300 dpi or less, giving an overview of their ride, process, safety features and any other details they would like to feature. These posters will be printed by the REC Committee and displayed at the competition event for a public audience alongside the ride itself.

Outreach (100 pts.)

Every team has a responsibility to give back to their communities in the form of STEM communication and education. Teams will submit an outreach paper detailing events and programs where they have enriched their community with education of Ride Engineering concepts and STEAM (Science, Technology, Engineering, Arts, and Math) education. The paper should include information such as what events and programs the team has created/contributed to, who the event/program impacted, lasting effects of the event/program, etc. Only events that occurred within the period of time between the previous competition and this year's event are eligible to receive points. For ongoing events please include relevant context and history.

The Bid (-100 pts.)

Each Team must present a Proposal Bid with their ride, evaluated and itemized at the value of all materials and manufacturing labor used to construct the Ride. Team bids will be compared and teams will be deducted points based on the value of their Bid relative to their competition. The Team with the highest value Bid will receive a deduction of 100 pts. The Team with the lowest value bid will receive no deduction. Remaining teams will receive deductions tiered linearly within that range based on their relative value rank. (e.g. If 5 teams are competing, deductions will be of 0 pts., 25 pts., 50 pts., 75 pts., and 100 pts.)

All materials included in the final assembly of the ride must be included in the bid at the value at which they were purchased. If this is unknown, a primary source price listing (from manufacturer or retailer) may be used as reference.

Manufacturing time performed by the team must be added to the Bid at a rate of \$20.00 per hour. This only means time spent altering parts or creating new parts. Assembly of created parts does not need to be included in the Bid. Engineering and Design Labor is not included in the Bid.

3D Printed parts are discouraged and will have a manufacturing cost of \$0.50 per gram.

Note: 3D printing adds an extremely high cost to the Bid Value (\$0.50/g compared to approx \$0.02/g for PLA filament), this is a deliberate action by the REC Planning Committee. 3D Printing can offer an unfair advantage to teams with access to 3D printing machines. Hobby 3D printing can create poor habits in regards to the desired learning outcomes of the REC in terms of use of Engineering Drawings for Manufacturing, Manufacturing Quality Assurance, and Designing for sourced Commercial-Off-The-Shelf (COTS) parts. 3D printing is allowed and teams are encouraged to use it for small highly functional or aesthetic components, but seek alternative manufacturing methods for the majority of their ride.

Spare parts used in servicing the ride during competition are not included in the Bid.

Bid documents are encouraged to be itemized lists with unit prices that sum to the final value.

Team bids determined to be likely inaccurate will be penalized in the rankings appropriately to the perceived inaccuracy by the judges.

Bids in previous years have ranged from \$150 to over \$7,000.

Teams

Eligible Competitors: Higher education students enrolled during the entirety of competition season.

Team Members: 2+ per team (4-10 recommended)

Majors: This is a multidisciplinary competition. Having team members from multiple fields of study, especially Mechanical Engineering AND Electrical/Controls Engineering is strongly advised.

Teams must consist of a minimum of two higher education students and one advisor. The advisor must be faculty or staff of an academic institution that represents at least one of the team members (in case of members from multiple institutions) If you are a student organization, you most likely have an advisor already.

The required involvement of the advisor is to be a contact and liaison to the academic institution. Advisors are encouraged to mentor the teams but may not significantly contribute to the design or fabrication of competition entries.

Graduate Students and Students on Co-op as part of their degree program may participate.

There is no maximum student member limit on a single team.

Teams may consist of members from multiple institutions.

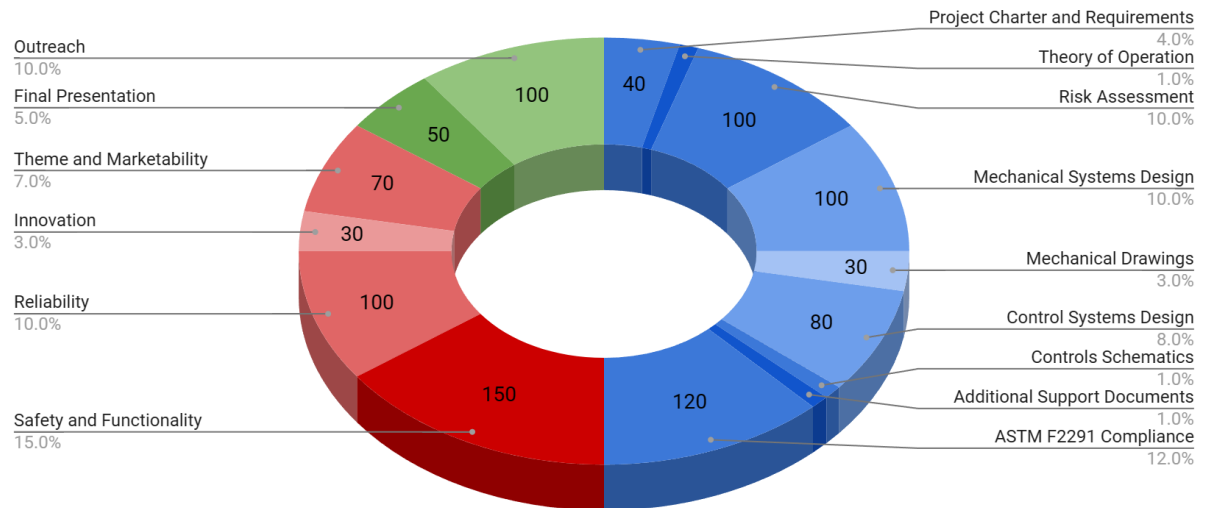
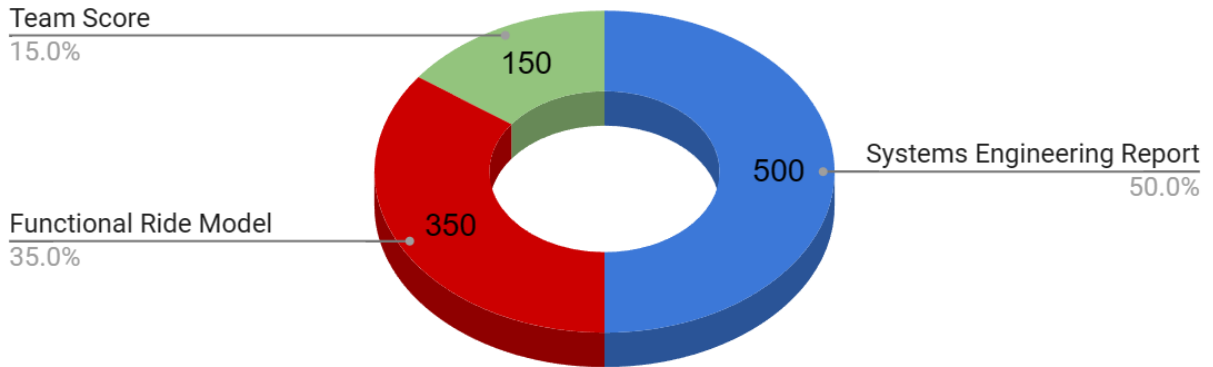
One institution may have multiple teams.

Advisors may advise more than one team.

Teams may not work in direct collaboration with other teams, however all are encouraged to practice “cooperitition” by communicating and assisting the community of teams with specific issues for the improvement of all teams. Teams at the same institution must work independently.

For any questions about team formation or conduct, contact the coordinators.

Scoring Overview



Summary of Deliverables

Name	Section	Score	Filename	Due Date
Initial Project Charter	REC Review	-	Teamname 2024 Initial PC	3 weeks after registration
Proof of Preliminary Design Review on Initial Risk Assessment and Concept	REC Review	-	Teamname 2024 PDR	February 10, 2024
Proof of Final Design Review	REC Review	-	Teamname 2024 FDR	March 2, 2024
Project Charter	Systems Engineering Report		Teamname 2024 PC	April 7, 2024
Theory of Operation	Systems Engineering Report		Teamname 2024 TOPs	April 7, 2024
Risk Assessment	Systems Engineering Report		Teamname 2024 RA	April 7, 2024
Mechanical Systems Design	Systems Engineering Report		Teamname 2024 MSD	April 7, 2024
Control Systems Design	Systems Engineering Report		Teamname 2024 CSD	April 7, 2024
ASTM F2291 Compliance Analysis	Systems Engineering Report		Teamname 2024 ASTM	April 7, 2024
Additional Drawings and Schematics	Systems Engineering Report		Teamname 2024 Drawings	April 7, 2024
Outreach Report	Team Score	100	Teamname 2024 Outreach	April 7, 2024
Poster	Marketability	10	Teamname 2024 Poster	April 10, 2024

Ride Engineering Competition

Proof of Life	REC Review		Teamname 2024 Proof of Life	April 10, 2024
Functional Ride at Event	Ride Model	35		April 13, 2024
Bid	Ride Model	(0, -100)	Teamname 2024 Bid	April 13, 2024
Safety Report	Ride Model	55	Teamname 2024 Safety Report	April 13, 2024
Failure Modes Analysis and Service Plan	Ride Model	50	Teamname 2024 FMA	April 13, 2024
Final Presentation	Team Score	50	Teamname 2024 Final Presentation	April 13, 2024

Submit Deliverables by Midnight on the due date on the REC
Website: <https://www.rideengineeringcompetition.org/>

Failure to submit Deliverables by the deadline may result in point
deductions.

Presentations and Events

Name	Section	Score
Safety Demonstration	Ride Model	45
Exposition of Innovation, Theming and Marketability	Ride Model	90
Final Presentation	Team Score	50

Full Scoring Rubric			
Item	Points Available	Additional Points for Excellence	Total
Systems Engineering Report	380	+120	500
Project Charter	30	+10	40
<p>Problem Statement</p> <p>In one sentence, what is the ultimate goal of this project?</p>	3		
<p>State-of-Art Research</p> <p>What similar products exist? How are they similar to this project? How will this project be different? What can we learn from what currently exists?</p>	4	+2	
<p>Stakeholders</p> <p>Who are the parties involved with the project, both internally and externally? What must be communicated between these parties and how and when does this communication occur.</p>	2		
<p>Initial Resources</p> <p>Teams shall identify what resources are currently possessed by the team and what resources need to be obtained before completion of the project. This includes personnel, information, workspaces, tools, materials, funding, etc.</p>	3		

Ride Engineering Competition

	<p>Scope of Work</p> <p>Teams shall identify what work is being performed and what party is responsible for that work. This shall include identification of Deliverables, and estimated schedule of work (e.g. Via a GANTT chart)</p>	8	+3	
	<p>Design Criteria</p> <p>Teams shall identify important criteria that must be met to satisfy the Problem Statement. These criteria shall be directly measurable with estimated values included.</p>	10	+5	
	Theory or Operation	7	+3	10
	<p>Ride Overview</p> <p>Teams shall describe the desired rider experience and the systems that make up the ride.</p>	3	+1	
	<p>Subsystem introduction</p> <p>Teams shall give a brief description of each subsystem in the ride and its functions.</p>	4	+2	
	Risk Assessment	75	+25	100
	<p>Thorough identification of Potential Hazards by all components to all people</p> <p>Are all reasonably foreseeable hazards identified? Are all aspects of the ride properly analyzed?</p>	30	+10	

	<p>Valuation of risk based on multiple risk factors and high-risk threshold</p> <p>What criteria are used to determine level of risk? Are values appropriate to the corresponding hazard? Are high-risk situations accurately identified?</p>	15	+5	
	<p>Actions taken for high-risk outcomes</p> <p>What actions are taken to reduce or eliminate the risk? How effective are these actions? Are new hazards introduced by this action assessed?</p>	30	+10	
	Mechanical Systems Design	75	+25	100
	<p>Design Description</p> <p>Teams shall describe the system so that a technical audience can clearly understand the architecture of the system and all of the components and their interactions included in that system.</p>	15		
	<p>Rationale / Research</p> <p>Teams shall provide information on similar applications to demonstrate that the chosen system is applicable and ideal for the problem space.</p>	15	+5	
	<p>Optimization</p> <p>Teams shall demonstrate an iterative process of improving design characteristics with consideration of criteria such as mechanical properties, manufacturing, assembly, serviceability etc.</p>	10	+5	

Ride Engineering Competition

	<p>Calculations</p> <p>Any values shall be calculated with appropriate formulae. Is the calculation accurate? Are the derivations appropriate?</p>	15	+5	
	<p>Verification</p> <p>Teams shall conduct simulations, tests, or prototypes to verify that the systems are operating as intended.</p>	20	+10	
	Control System Design	60	+20	80
	<p>Design Description</p> <p>Teams shall summarize the system so that a technical audience can clearly understand the architecture of the system and all of the components and their interactions included in that system.</p>	10	+3	
	<p>Rationale / Research</p> <p>Teams shall provide information on similar applications to demonstrate that the chosen system is applicable and ideal for the problem space.</p>	20	+7	
	<p>Hardware Design</p> <p>Teams shall be awarded points for the quality of the architecture of the electrical and mechanical components that make up their control system.</p>	15	+5	
	<p>Software Design</p> <p>Teams shall provide information on the structure and function of their software system, as well as an explanation of their code.</p>	15	+5	

ASTM F24 Compliance Analysis		90	+30	120
Identification of Applicable Standards		10	+5	
What passages apply to the ride system? Which passages do not apply and why do they not apply?				
Identification of Points of Compliance		20	+5	
What measurable criteria must be met to ensure compliance? Teams will give persuasive rationale for their interpretation of the standard language.				
Verification of Compliance		60	+20	
Show that each point of compliance is met through analysis, testing, or calculation. Ensure points of compliance are in alignment with team definitions.				
Schematics and Drawings		40	+10	50
Complete Engineering Drawing Package		30		
Engineering Drawings of all components to a consistent drawing standard (ASME Y14.100 recommended). Drawings shall include all relevant information needed to manufacture and assemble the ride mechanism.				
Schematics of all Controls and Electrical systems		10		
Schematics shall document the connections between components and specify electrical characteristics of each connection (Voltage, Protocol, etc)				

Ride Engineering Competition

		Additional Technical Support Documents	0	+10	
		Additional Documents that further illustrate the system such as animations, manuals, exploded views, etc.			
				Sub - Total	500

Ride Engineering Competition

Item	Points Available	Additional Points for Excellence	Total
Functional Ride	260	+90	350
Functionality / Safety	120	+30	150
<p>Functionality</p> <p>Teams shall demonstrate to judges that their ride functions in accordance with the desired mode of operation detailed in the Systems Engineering Report.</p>	25	+10	
<p>Prompt</p> <p>Teams shall demonstrate to judges that the ride experience meets the customer requirements included in the prompt.</p>	15		
<p>Safety Report</p> <p>Teams shall create a Safety Report detailing the designs, considerations, and functions that keep all parties safe in regards to the ride in normal and abnormal foreseen situations.</p>	40	+15	
<p>Safety Demonstration</p> <p>Teams shall demonstrate to judges that their ride operates safely in regard to all parties in accordance with their Safety Report Document. Teams shall demonstrate active and passive safety functions. Teams shall demonstrate measures taken to ensure rider safety when maintenance/down time is necessary.</p>	40	+5	

Reliability / Serviceability	95	+5+	100
<p>Failure Mode Analysis and Service Plan</p> <p>Teams shall identify expected modes of failure that they may need to service during the 6 hour day of operation. Teams shall document the tasks required to service expected modes of failure and have all needed parts, tools, and knowledge to perform the service.</p>	15	+5	
<p>Reliability</p> <p>Teams will be awarded up to 80 points based on percentage of uptime at the end of the 6 hour operation period. $80 * (\text{uptime} / \text{total time})$</p>	80		
<p>Service Execution</p> <p>Teams that can efficiently return their ride to operation can earn back all reliability points lost. Having the failure mode identified and a service plan documented and used effectively will warrant additional points.</p>	Up to lost reliability points	+ Amount determined by judges	
<p>Incident Penalty</p> <p>Major incidents will yield additional penalties based on the severity of the incident on riders. (Minimum score is 0/80)</p>	Max -20 per rider for ejection		

Ride Engineering Competition

Innovation	20	+10	30
Innovation Teams shall communicate the qualities of their ride concept that demonstrate new advances in ride design, both for local guests and the industry as a whole.	20	+10	
Theme and Marketing	55	+15	70
Implementation Is the theme apparent from up close and at a distance? Is the theme communicated visually without explanation?	15	+5	
Story Teams shall demonstrate how the theme is communicated to riders experiencing the ride.	15	+5	
Marketing Teams shall demonstrate how the ride and theme can be communicated to potential new riders.	15	+5	
Informational Poster 24" x 36" Poster, 300 dpi or less, giving an overview of their ride, process, safety features and any other details they would like to feature. Presenting a poster rewards all 10 points (all or nothing)	10		

Ride Engineering Competition

	Bidding	-100	0	-100
	<p>Bid ranking</p> <p>Each Team must present with their ride a Proposal Bid evaluated at the value of all materials and manufacturing labor used to construct the Ride. Team bids will be compared and teams will be deducted points based on the value of their Bid relative to their competition. The Team with the highest value Bid will receive a deduction of 100 pts. The Team with the lowest value bid will receive no deduction. Remaining teams will receive deductions tiered linearly within that range based on their relative value rank.</p>	-100		
			Sub - Total	350

Ride Engineering Competition

Item	Points Available	Additional Points for Excellence	Total
Team Points	115	+35	150
Outreach	75	+25	100
<p>Outreach Report</p> <p>Teams shall create a report outlining outreach events in which team members participated including details of the lesson plan and how it was communicated, demographics of the audience reached and number of people reached. Events that promote STEAM education (Science, Technology, Engineering, Art, and Math) and careers in the Attractions industry are encouraged. Teams that demonstrate a strong presence and positive impact on their community will earn additional points.</p>	75	+25	
Final Presentation	40	+10	50
<p>Communication of Content</p> <p>Teams shall have 2-3 members clearly present the Team’s design, rationale, process, and results. Teams have 10 minutes to present a multimedia presentation to a panel of judges, allowing 5 additional minutes for questions. Teams may use documents, pictures, videos and more to effectively and completely communicate their work.</p>	30	+10	
<p>Presentation Skills</p> <p>Teams shall demonstrate professionalism and preparedness via attire and rehearsal.</p>	10		

Ride Engineering Competition

				Sub - Total	150

Summary			Points Available	Additional Points for Excellence	Total
Systems Engineering Report			380	+120	500
Functional Ride			255	+95	350
Team Points			115	+35	150
			750	+250	
				Total	1000