

## 2010 Roller Coaster Rules

### What is Tau Beta Pi and What Does it Represent?

Tau Beta Pi is a National Engineering Honor Society. The members of Tau Beta Pi are not only the top students in their graduating class, but they also participate in community service activities.

The Iowa Alpha Chapter at Iowa State University has been recognized nationally for the service projects that it has organized, and has taken the challenge of hosting a roller coaster competition for middle and high school students. Marc Hermon, an Urbandale High School teacher, started this competition in order to reach out to high school students who have an interest in mathematics, physics and engineering. The competition gives students an opportunity to apply theory to a project that is both fun and challenging.

### Engineering

Creativity and problem solving are two high order thinking skills that are hard to teach. All that really can be done is to provide opportunities for students to apply and practice these skills. This competition is designed to fulfill that purpose. The problem solving skills that students will learn will be invaluable in any field their path takes them (engineering, science, other). Experimentation and asking questions are essential to maximum performance. Students should not worry about making mistakes because they will make hundreds. They will run into many problems that they did not foresee. Engineering is a process by which ideas are tested and re-tested in an effort to produce the best working product. A good engineer knows one way to get something to work and 99 ways it won't work. This competition is also designed to promote interest in engineering and science. The competition is open to all students in grades 7-12.

### Your mission:

Your mission, if you choose to accept it, is to build a roller coaster that transports a ball from a specified starting point to a specified end point (10-25 mm ball bearings work best) in 1 minute  $\pm$  5 seconds, and completes the Rube Goldberg Challenge. Prefabricated construction toys such as hot wheels or any other type of track, tinker toys, Lincoln Logs, Legos or K'Nex may not be used. Any type of energy may be used except chemical (includes fire!), human, NUCLEAR, and electric. Basically, the coaster must be mechanical (springs, rubber bands, magnets and gravitational potential energy) and once the ball is moving on its own, no one may touch the ball, the coaster, or influence its performance in any way. The same ball that begins the coaster does not have to be the same one that ends, which means the energy from one ball can be transferred to that of another ball. Once one ball starts another ball, the first ball should stop shortly thereafter. Also, there is a new rule this year—**no water allowed!**

### **This year's Rube Goldberg challenge:**

This year the judges request that you design a roller coaster that incorporates two (2) sets of at least five (5) dominoes.

### **Previous years' challenges:**

- 2001 incorporate a mouse trap
- 2002 initial lift using any type of energy
- 2003 2-ball mechanism
- 2004 dollar deposit
- 2005 basketball hoop
- 2006 light up light bulb
- 2007 raise your school flag
- 2008 ring the carillon in the campanile
- 2009 basketball hoop

### **Award Qualifying Requirements**

#### **Structure Requirements**

1. Must be free standing.
2. No prefabricated toys used to create the functional roller coaster although they can be used for the theme/decoration.
3. The assembled coaster must be no larger than **4' long by 2.5' wide by 4' high** (this is so the coaster will fit conveniently through a standard door opening)

#### **Competition Requirements**

1. Project display board which at minimum contains coaster name and engineer's names.
2. Successful implementation of Rube Goldberg challenge.
3. One successful run of 30+ seconds.
4. Completion of run from the specified starting point to the specified ending point.

### **Judging & Awards**

Judging will be based on the three categories: Presentation, Overall Theme, and Technical Skill. Before you present your roller coaster you will clearly state to the judges where your starting and ending points are located. Once this decision has been made it **CANNOT** be changed. If the ball traverses the entire coaster from start to finish **AND** does so in a time of 1 minute with a +/- 5 second leeway, then your technical score will be **DOUBLED**.

**Presentation:** (20pts) Judges will examine your professionalism, technical knowledge, and general speaking style (posture, eye contact, all member participation). Engineers will point out starting and ending points and describe all of their technical “tricks” at this time.

**Overall Theme:** (20pts) Judges will examine the team’s use of a theme and how it was integrated into their coaster, on the display board, any signs on the coaster, the naming of sections of the coaster, music, and costumes.

**Technical Skill:** (30pts) Judges will examine how many technical “tricks” were performed and assign a technical score out of 30 points. Your technical score is very important because if your ball travels from your start point to your end point successfully and does so in 1 minute ( $\pm 5$  seconds) the technical score will be doubled.

### **YOU WILL RECEIVE UP TO THREE TRIALS TO DEMONSTRATE A SUCCESSFUL RUN!**

You may have up to 2 minutes to reset the coaster in between unsuccessful trials, but your starting and ending points will remain the same. If you can’t reset within the 2 minutes, it will be considered an unsuccessful run. Once a successful run has been demonstrated, the coaster will not be run again. A successful run is one that makes it from start to finish in 30+ seconds. Example: A coaster that has a successful run of 54 seconds on its first attempt will NOT have their technical score doubled or have an opportunity for another run. A coaster that has a successful run 55 seconds on its first attempt WILL have its technical score doubled. All contestants should examine the Judges Form.

The ISU Tau Beta Pi Engineering Honor Society will do the judging. Two events will be judged separately, one for the high school students and one for the middle school students. Awards will be presented for 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> places based on the overall scores for both the middle school and high school events. Three additional awards will be given for both events (middle school and high school); one for each of the top scores in the three judged categories.

### **When & Where**

The competition will be held Thursday, April 1<sup>st</sup>, 2010 beginning at 10am in the atrium of Howe Hall on the Iowa State University campus. Please visit [www.iastate.edu](http://www.iastate.edu) for maps, directions, and additional information regarding this location.

## **Teams & Coaches**

Each team of 4-8 students may enter only one coaster. Each school may enter a plurality of teams/coasters. Coaches that are parents or teachers may participate with the team by expressing ideas and suggestions and providing workspace and tools; however, the coach may in no way actively help in any construction of the coaster.