

American Society of Mechanical Engineers,
Student Chapter of the University of Southern Indiana
is proud to present the

USI LEGO ROBOTICS COMPETITION 2010

*with support from the USI Pott College of Science and Engineering
and Southwestern Indiana STEM Resource Center*

This document, along with supplemental resources, is available online:

<http://web.usi.edu/asme/usilego10.html>

Background

The USI Lego Robotics Competition was first announced in Fall 2007 as a collaborative event between USI's student chapters of the American Society of Mechanical Engineers (ASME) and the Institute of Electrical and Electronics Engineers (IEEE). The competition was held April 18, 2008 and was acclaimed as a great success by those involved. It reached 56 students in the Evansville area in 2008 and by 2009, 108 students were competing. The competition is organized and run by USI ASME with the support of the faculty, staff, and students in the USI Engineering Department. It is now an annual event, with the USI LRC 2010 as the third competition. We hope to expand our outreach this year to reach over 150 students, not just within the Evansville area.

Registration

Registration for the USI LRC 2010 is due April 9. Teams can register online at <http://web.usi.edu/asme/register10.html>

USI Lego Robotics Workshop

Friday March 19, 2010 – Technology Center
4:00 – 8:00 pm

USI Lego Robotics Competition 2010

Friday April 23, 2010 -University Center (Carter Hall D)
4:00 – 8:30 pm

Contact Information

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Food – Boxed Lunches

USI ASME will be serving boxed lunches during the 6:00 break. If you would like a boxed lunch, please send a request along with your team registration or send an order through email to kwschnautz@mail.usi.edu.

Please give an exact number of lunches needed.

We will not order extra lunches.

Payment is requested during check-in the night of the event.

BOXED LUNCH - \$7.00/ea

Your choice of ham, roast beef, or turkey served on croissant with cheese, lettuce and tomato.

Each boxed lunch is \$7.00 and includes a sandwich, chips, mixed fruit, cookie, and soft drink. Lunches should be ordered by April 9 and can be paid for during sign-in on competition night (April 23)

Include the following in your order:

FOOD ORDER FORM

Name(s):

Ham:

Turkey:

Roast Beef:

Objective

Traverse from Platform A to Platform B by an acceptable method, as described in “Gameplay.”

Gameplay

There are four acceptable methods in which the objective may be completed. Robots may travel from point A to point B by following paths A-D.

- A) Starting on Platform A, travel across the 15” gap onto Platform B.
- B) Starting on Platform A, travel across the 9” gap onto Platform B.
- C) Starting on Platform A, travel down the ramp, over the bridge, and end on Platform B via the ramp. The black line may be used as a guide.
- D) Starting on Platform A, travel down the ramp and back up the opposite ramp to end on Platform B, avoiding the bridge.

The steps along each path are as follows: (For a diagram, see “Course Specifications.”)

PATHS A & B:

STEP I: Initiate bridge-building sequence

This step is completed as soon as the robot and/or bridge begins to extend over the edge of the 9” or 15” gap.

STEP II: Build bridge

A bridge is any object that spans the gap between Platforms A and B without touching the course's base. One point will be deducted if any part of the robot or bridge comes in contact with the base.

STEP III: Cross bridge successfully

The robot must cross the bridge and end up on Platform B. The bridge may be left spanning the gap between Platforms A and B.

STEP IV: Bridge removal

Although not required, if the robot successfully picks up the bridge after successfully crossing the gap, extra points can be earned. Removal of the bridge means that it is no longer touches Platform A and is only supported by (1) the robot or (2) Platform B.

STEP V: Completion

The course is completed when the entire robot is within Platform B's boundaries.

PATH C :

STEP I: Drive down ramp

Robot must successfully drive down ramp coming from Platform A.

STEP II: Drive up hill

Robot must successfully drive up the hill, ending entirely on the level portion of the hill.

STEP III: Drive down hill

Robot must successfully drive down the hill.

STEP IV: Drive up ramp

Robot must successfully drive up ramp going to Platform B, ending entirely within the boundaries of Platform B.

STEP V: Completion

The course is completed when the entire robot is within Platform B's boundaries.

PATH D :

STEP I: Drive down ramp

Robot must successfully drive down ramp coming from Platform A.

STEP II: Drive up ramp

Robot must successfully drive up ramp going to Platform B.

STEP III: Completion

The course is completed when the entire robot is within Platform B's boundaries

Rules

- Each round will last two minutes, at which time, all points that have been accumulated during the round are totaled.
- When competing, team members must stand in designated areas only. Touching the course or robot during a round may result in disqualification.
- Teams are not to touch the robot after a round begins. After 2 minutes, the *judges* will stop the robots. The teams are to wait to remove the robot until a score is calculated.
- If at any time, a team would like to terminate their round (stop the clock) they must announce so to the judges. After the judges stop the clock and the robot, they will permit the team to remove their robot from the course.
- The round must be started with the robot within the boundaries of Platform A.
- While robots may temporarily extend beyond the boundaries, they must begin and end each round within the boundaries of the course. Should a robot fall off the course accidentally, the round should end immediately, and points totaled.
- Robots may not cause damage to the course. Purposeful damage of the course results in immediate disqualification.
- In certain situations, judges may allow a rerun (e.g., if a robot fails to move)
- Judges have final discretion over all matters.

Robot Specifications

ROBOTS MAY BE INSPECTED AT ANY TIME BY THE JUDGES FOR COMPLIANCE WITH THE FOLLOWING SPECIFICATIONS:

- The size constraint for the assembled robot must be 12"x12"x12". Robots may expand beyond this size after a round begins, however the initial size must begin within the 1' cube. This includes the bridge, if applicable.
- Robots must be assembled using only the pieces provided in the kits. This does not include, however, the box, tub, papers, or storage compartments, etc.
- Acceptable kits are as follows:
 - RCX
 - Team Challenge Set (9794)
 - Robotics Invention System 2.0 (3804)
 - NXT
 - Education set (9797)
 - Mindstorms NXT 2.0 (8547)
- If you have a kit other those listed above, feel free to contact us and we will approve it if deemed acceptable. Kits other than those listed above are prohibited, and using other systems may lead to disqualification.
- Only the LEGO elements of ONE KIT are to be used per team.
- No pieces may be modified in any way.
- All robots must be fully autonomous. (No remote control or outside interference allowed.) Outside interference includes loud noises (e.g., clapping)
- Leads or wires cannot be used to hold a robot together.
- Robots should be assembled prior to the USI Lego Competition, however there will be time between rounds for revisions.
- Teams are allowed only one robot to compete. If modifications are required, this can be done between rounds.

Team Constraints

Any local middle school, high school, or college student may compete. Teams of up to four persons are to work together to design, build, and program a Lego robot to complete the given task. To allow a greater diversity in the competition, both the old RCX kits and the new NXT kits are permitted. Teams will be put into divisions based on the grade level. Divisions will be as follows:

- Middle School RCX
- Middle School NXT
- High School
- College/University

Programming

It is recommended that teams bring their own portable computer, as there is no computer lab located within the University Center.

USI will have a limited number of portable computers available in Carter Hall during the competition and will be available for programming purposes ONLY. These computers should remain in Carter Hall and should be used in the designated area(s) only. Portable computers cannot be “reserved” or withheld when not in use.

- Any programming language is acceptable (RoboLAB, NQC, NXC, RobotC, LeJos, Java, MATLAB), though the program must be the original work of the students on the team.
- Teams should bring any computer/software/equipment needed to program. IR Towers, Bluetooth dongles, and USB cables will NOT be provided during the competition.

Scoring

Scores will be calculated based upon the following:

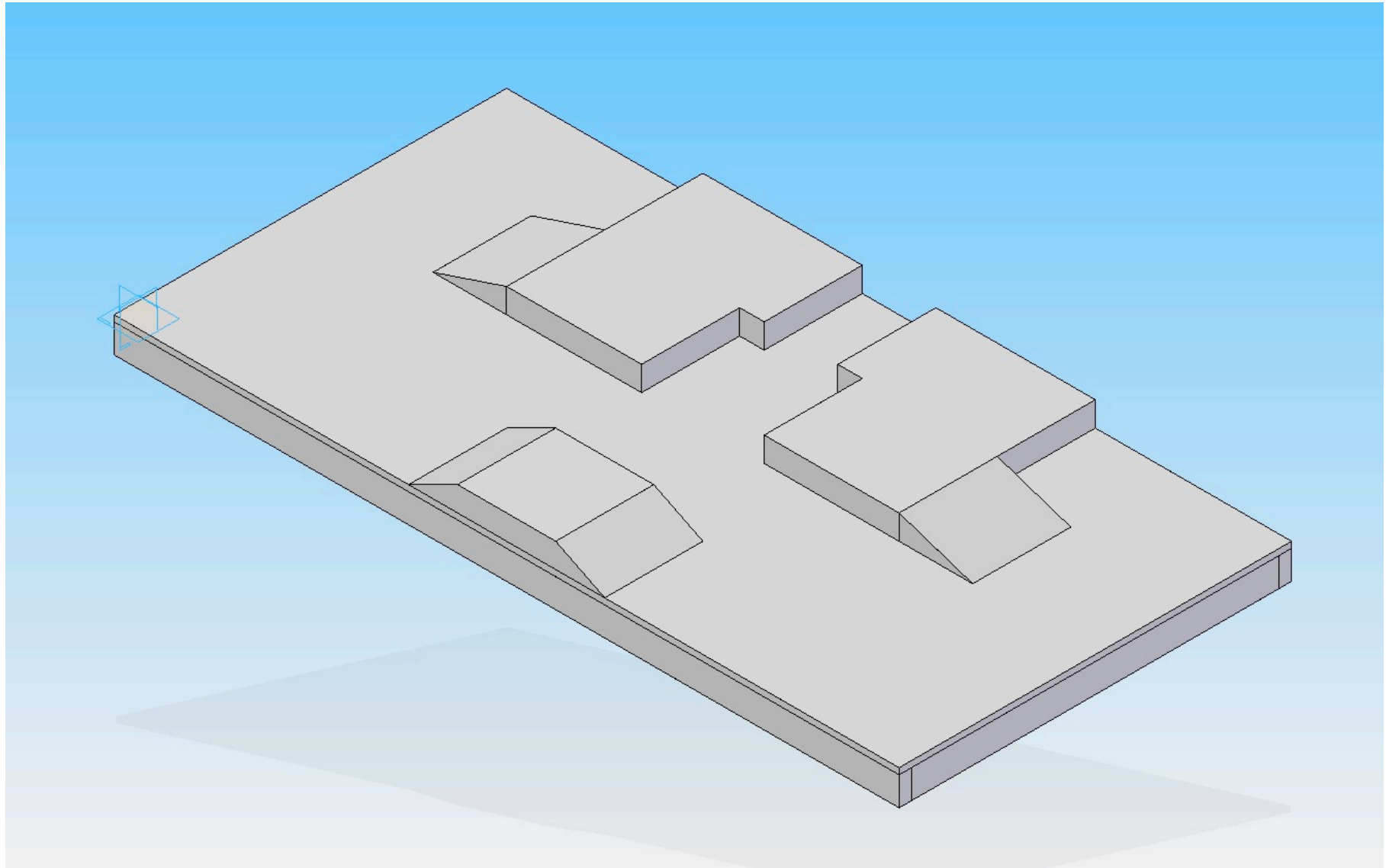
PATH	STEP I	STEP II	STEP III	STEP IV	STEP V	POSSIBLE DEDUCTIONS	TOTAL POSSIBLE POINTS
A	Initiate bridge building 1 point	Build bridge 3 points	Cross bridge successfully 3 points	Bridge removal 3 points	Completion 1 point	Bridge touches bottom of course -1 point	11
B	Initiate bridge building 1 point	Build bridge 2 points	Cross bridge successfully 3 points	Bridge removal 2 points	Completion 1 point	Bridge touches bottom of course -1 point	9
C	Drive down ramp 1 point	Drive up hill 2 points	Drive down hill 1 point	Drive up ramp 2 points	Completion 1 point		7
D	Drive down ramp 1 point	Drive up ramp 2 points	Completion 1 point				4

Teams will be allowed to attempt the course during two separate rounds. They may attempt only one path per round and gain points for each step completed during a round. Steps may not be repeated for additional points. Each step may be completed only once per round, with the maximum score as listed. Only the highest scoring round for each team will be counted.

In case of a tie, time should be the tie-breaker.

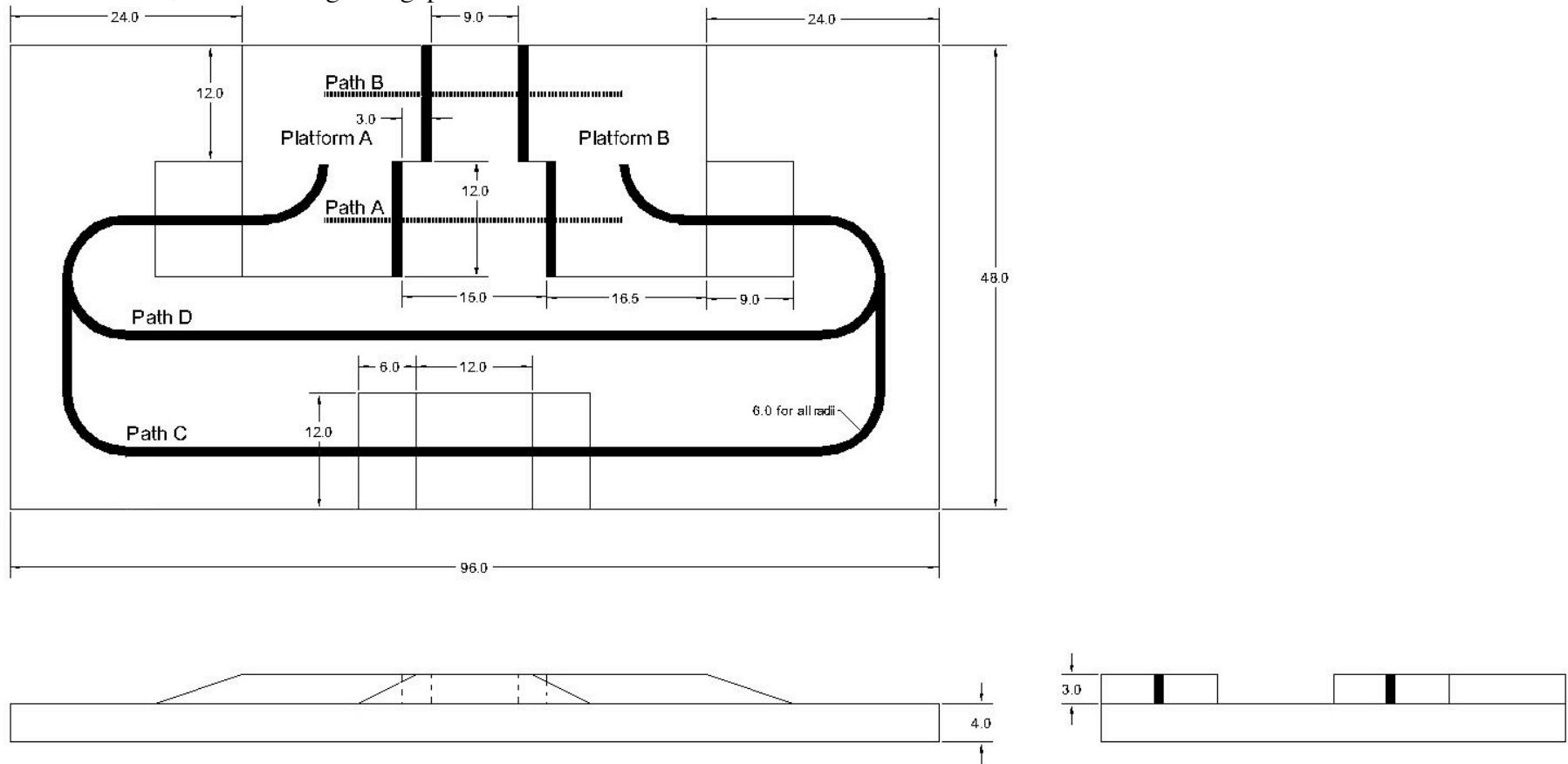
Course Specifications

The course will be constructed as specified in the following diagrams.



(Note, surface color and paths are omitted in the above view)

The course is constructed of wood, painted flat white on all surfaces, unless noted otherwise. The lines are 1" wide and painted flat black. There are lines, 1" wide along the "gap" between Platforms A and B.



These diagrams are available in electronic form online: <http://web.usi.edu/asme/usilego10.html>

Awards

Prizes will be awarded for first, second, and third place teams in each division.

Location and Schedule

The USI LRC 2010 will be held at the University of Southern Indiana.

The competition will be held in Carter Hall D, located within the University Center.

During the competition, a computer lab within the Technology Center will remain open in case a team needs to revise their program before competing.

USI Lego Robotics Workshop

Friday March 19, 2010 – Technology Center

4:00 – 5:00 pm	Workshop
5:00 – 5:30 pm	Break
5:30 – 8:00 pm	Course available for hands-on testing

USI Lego Robotics Competition 2010

Friday April 23, 2010 -University Center (Carter Hall)

4:00 – 4:30 pm	Sign-in
4:30 – 4:45 pm	Welcome / Review rules and regulations
4:45 – 6:00 pm	Round 1
6:00 – 6:30 pm	Break – Eagle’s Nest**
6:30 – 7:45 pm	Round 2
7:45 – 8:00 pm	Break
8:00 – 8:15 pm	Closing Ceremony

** During break, pre-ordered boxed lunches will be sold in the “Eagle’s Nest” or the food court in the University Center.

Frequently Asked Questions (FAQ)

Q: Is the Lego NXT accessory kit (9648) permitted? Which kits can we use?

A: No. Kits are limited to those described in “Robot Specifications.” If your kit is not listed, contact us and let us know. We'll make an informed decision based on the contents of your kit. Competing with a kit that is not approved may result in disqualification.

Q: Must the robot start on the black line or can you start anywhere on Platform A facing in any direction?

A: The robot may start in any orientation on Platform A such that it does not extend beyond the boundaries of Platform A, and is not larger than the 12”x12”x12” size constraint.

Q: How would the scoring work if a team would have the robot drive off the edge of platform A, into the 15” gap, and then back up onto platform B?

A: Referencing the “Gameplay” section,

The steps along each path are as follows: (For a diagram, see “Course Specifications.”) PATHS A & B:

STEP I: Initiate bridge-building sequence --This step is completed as soon as the robot begins to extend over the edge of the 9” or 15” gap.

STEP II: Build bridge --A bridge is any object that spans the gap between Platforms A and B without touching the course's base. One point will be deducted if any part of the robot comes in contact with the base.

STEP III: Cross bridge successfully -- The robot must cross the bridge and end up on Platform B. The bridge may be left spanning the gap between Platforms A and B.

STEP IV: Bridge removal -- Although not required, if the robot successfully picks up the bridge after successfully crossing the gap, extra points can be earned.

STEP V: Completion The course is completed when the entire robot is within Platform B's boundaries.

The described method would accomplish steps I and V. Since there is no bridge, steps II, III, and IV are not possible. The score would be:

STEP I: 1 point

STEP V: 1 point

Penalty: -1 point

TOTAL: 1 point.

Q: What constitutes a “bridge”?

A: A “bridge” is defined as any object that spans the gap between Platforms A and B without touching the course's base.

Q: Does the bridge need to be completely over Platform B to score steps IV or V (Paths A & B)?

A: Simply put, no. The removal of the bridge is optional. If you are able to pick up the bridge (detach it from Platform A) then you receive points for STEP IV. As soon as the robot (minus the bridge) is completely over platform B, you score points for STEP V.