

The concept

- ◆ Graphical system Design, Prototyping and Deployment

Alignment with curriculum

- ◆ Virtual Instrumentation
- ◆ Embedded control system design
- ◆ Rapid prototyping concepts

Expectations

Tier-1	Tier-2	Tier-3 *
Choose an existing automotive system component from list and develop the linear mathematical model of the plant. List: Power train, suspension, steering, engine, transmission, gear, fuel cell, hybrid power, fuel injection.	Use the interactive LabVIEW Control Design Assistant and Mathscript window to develop linear model of the plant model. Analyze the open loop characteristics of the plant using time or frequency response functions. Synthesize the model of a controller for controlling the linear model of the plant. Simulate the controller and analyze the open loop characteristics.	Add non-linearity to the plant model to accommodate for real world operating conditions. Connect the controller to the plant model and analyze closed loop characteristics of the model. Complete the control design process by running the plant model on the PC and demonstrate controllability and observability of the plant and controller by deploying the control process on Compact RIO.

***For the pilot year 2008, Tier-3 is not required**

Kits and aids

- ◆ LabVIEW Student Edition, Training manuals for LabVIEW, Single board RIO.

Competition rules

- ♦ Actual modeling done off line
- ♦ Demonstration and deployment at the competition

Teams

- ♦ Team size: 3 students, one student will be from Circuit branch
- ♦ Number of teams for Tier-1 = number of members / 10
- ♦ One team from each college moves to Tier-2 (division level)

Judging criteria

Tier-1	Tier-2	Tier-3
<ul style="list-style-type: none"> ▶ Choice of the sub-system for modeling - 30% ▶ Completeness of plant mathematical model - 30% ▶ Accuracy of plant model -40% 	<ul style="list-style-type: none"> ▶ Graphical plant model generation – using System Identification- 20% ▶ Open loop characteristics of plant– from system ID model - 20% ▶ Graphical controller model generation – using System Identification- 20% ▶ Simulation of controller and choice of control structure and control co-efficients- 40% 	<ul style="list-style-type: none"> ▶ Simulation results of linear plant model- 10% ▶ Simulation results of non-linear plant model- 20% ▶ Tuning of controller for non-linear operating conditions- 20% ▶ Closed loop analysis - 20% ▶ Deployment of controller and demonstrating controllability and observability parameters- 30%