



# SEED Lab – Systems Exploration, Engineering and Design Laboratory

## Principles of the Course

SEED Lab is a project based course where students work in teams on a single challenge project that changes from semester to semester.

The following are features of the SEED lab:

- The project requires expertise in more than one area of EE
- Students choose specialization and work in groups to complete the project
- The project requires multiple systems to be integrated
- Success requires finding and utilizing information about subsystems, along with building, testing and debugging hardware and software
- Project design includes the development and validation of system and component models
- Part of the course grade depends on the performance of the built system at a series of demonstrations
- Undergraduate Course Assistants provide guidance and assistance

## Reflection and Redesign

In the first part of the course, students learn tools relevant to their area of specialization, and give a demonstration of their proficiency on these tools. Then, students work in groups to complete the challenge project. There are three cycles of development and demonstration, allowing students to reflect on their designs and design methods, motivating improvement. Students keep reflection logs with prompts "What did I learn from my experience (good or bad)?" and, "How can I use the lessons learned from my experience in the future?"

## AY 15/16 Project

Your employer has determined that a highly maneuverable robot with small footprint that can quickly carry items from one location to another has a viable market for sale to hospitals. Your team is assigned to design and build a two-wheeled balancing robot that can carry cargo to a desired destination.

Performance Criteria:

- Robustness: Number of failures to receive a command to start, or detect an obstacle (smaller is better).
- Size: Largest dimension of the of the robot (height, width, or depth, smaller is better).
- Speed Regulation: Variance of delivery time (smaller is better).
- Stopping Accuracy: Average distance from target when stopped (smaller is better).
- Balancing Capacity: Weight of cargo that can be successfully carried to target (larger is better).
- Telemetry: The amount of data that can be wirelessly transmitted regarding robot performance during a run (larger is better).



## Supporters

Support for the the SEED Lab has been generously provided by:

- Epilog Laser
- ArcelorMittal

## Working in Technical Groups

Students chose area of specialization before the course begins. Currently the areas are control systems and embedded processors. Students work in teams of 3 to 4 with members from both areas. The project is complex enough that members must all contribute for the group to be successful.

Teams are provided resources on good group habits, and are asked to develop a team contract that defines acceptable behavior in the group.

The teams meet weekly to go over progress and define goals for the next week.

Before each demo students rate their team members using CATME. Feedback from ratings are provided to students.

