Robotics Syllabus

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Course Description

Robotics is a lab-based course that uses a hands-on approach to introduce the basic concepts of robotics, focusing on the construction and programming of autonomous mobile robots while providing a pre-engineering foundation. Course information will be tied to lab experiments; students will work in groups to build and test increasingly more complex mobile robots, culminating in an end-of-semester robot contest. We will be using *VEX Robotic Design System* as our platform. Students will be divided into groups and complete a variety of robot construction and programming activities within the confines of these groups.

Course Objectives

In this course, students will:

1. Explore the broad scope of robotic applications
2. Learn the basic components and building blocks of robots
3. Develop the robot construction skills
4. Learn to program the robots
5. Program autonomous mobile robots to achieve challenging tasks

Course Requirements and Materials Needed

1. Hardware: *VEX Robotics Design System*, accessories and tools (provided by school).
2. Software: *ROBOTC* license (provided by school).
3. Engineering journal: a college ruled composition notebook.

Instruction Materials

1. *2017 VEX Inventor's Guide*, VEX forum website: http://www.vexforum.com/wiki/index.php/Inventor's_Guide.

2. VEX Curriculum 2.0, Carnegie Mellon Robotics Academy website: http://www.education.rec.ri.cmu.edu/roboticscurriculum/vex_online/.

3. ROBOTC Curriculum for the VEX, robotc.net website, http://www.robotc.net/education/curriculum/vex/.

4. *Teaching ROBOTC for Innovation First Robots,* Carnegie Mellon Robotics Academy website: http://www.robotc.net/vex_full/.

5. Instructional Video: Various on-line videos of robotics research.

6. Website: Class website dynamically provides further learning resource.

Course Format

1. Lectures.
2. Video and multimedia presentations.
3. Group work and discussions.
4. Laboratory investigations.
5. Group competitions and activities.
6. Mini and term projects.
7. Homework assignments.

Content Outline

This course is divided into:

1. Entering the robotics world
   a. Introduction to robotics
   b. STEM careers
   c. Safety and project management
2. Robotics: Mechanics
   a. Materials, construction & motion
   b. Motors & gears
3. Robotics: Electricity
   a. Electricity & batteries
   b. Remote controllers
4. Robotics: Sensing & controlling
   a. Microcontrollers
   b. Sensors
5. Programming: Motion
   a. Setup & fundamentals
   b. Movements
6. Programming: Sensing & controlling
   a. Radio control
   b. Sensing
7. Project:
   a. Planning
   b. Design
   c. Implementation
   d. Testing
   e. Presentation & documentation
8. VEX Challenges

Expectations

1. Attend class daily, on time and ready to work.
2. Participate and contribute to group assignments and projects.
3. Maintain a daily, complete, organized engineering journal.
4. Have all assignments done and submitted when they are due.
5. Review work done each day.
6. Spend an appropriate amount of time preparing for tests.
7. Exercise safety and common sense at all times.
8. Have a mutual respect for fellow students and their right to an education.