Robotics 1-2: Introduction to Robotics

Course Syllabus Instructor: Mr. Nick Fenger Contact: nfenger@pps.net Prerequisites: None	Curriculum: PPS Canvas LMS Grade Reporting: PPS Parent & StudentVUE) Credit: 1.0 Elective and CTE Credit (Engineering Program of Study)

Overview

The goal of this course is for students to gain an introductory understanding of robotics and automation engineering disciplines and the iterative design process by designing, building and programming robots as individuals and small teams. Each new concept is introduced through puzzle-like robotic challenges and in-class robotic team competitions. The robotics content is intended as a starting point for students who have little or no experience. Curriculum add-ons and challenges are included for more advanced students.

The class is designed to be a foundation and exploration class leading to future studies in our technical and engineering and robotics courses. The course sequence is designed to help high school students understand basic programming, mechanical, and science/math concepts.. The relation of robotic concepts to physical science and computer science is stressed to help students make connections to other areas of study.

The course is focused on robotic problem solving activities requiring motors, sensors, controls and outputs across several virtual robotic platforms that include Lego and VEX Robotics. Approximately 8 of the 12 weeks are dedicated to the Lego platform where basic robotic programming concepts are studied. After this, students are introduced to the VEX platform where more advanced concepts are studied.

Learning Outcomes

By the end of this course students learn the following hard skills:

1. Can build and construct robots using Lego and VEX robotics platforms
2. Can make robots interact with the environment using motors, levers, grippers and other mechanical components
3. Can make robots “intelligent” through the use of sensors included, switches, distance sensors, gyroscopes, etc...
4. Can program robots to navigate mazes and solve challenges
5. Work as a team to build and program a robot to solve design challenges
6. Work as a team to compete against other robot building teams.
7. Can come up with innovative solutions to real world robotics applications

By the end of this course students learn the following soft skills:

1. Be able to break up a design problem into smaller tasks.
2. Develop a step-by-step plan to accomplish a goal.
3. Present ideas clearly and effectively.
4. Work effectively within a team.
5. Be able to revise the plan as needed to accomplish the goal.

6. Be able to reflect on the outcome to approach the next problem differently based on what has been learned.

Assessment

Students are formally assessed through their completion of background modules and by demonstrating competencies in project work. Students are offered many choices including, project focus, level of challenge, their teammates and role(s) in project work. The element of choice provides students unique experiences that differentiate them when applying for scholarships, internships, college, etc..

Students document their project work in a journal and reflect on their learning periodically. A final project report and documents the entire project with photos, narrated videos and brief written summaries describing their process. Project reports serve as documentation of student choices and their unique skills. Reflection on the outcome of their choices and collaboration with teammates in these reports is essential to the content of letters of recommendation.

Grading Policy and Philosophy:

This is a project-based course, because of this, the usual model of learning material and then demonstrating mastery in a final exam doesn't easily apply. In a project-based class there are multiple milestones students are expected to achieve throughout the project cycle. Students are asked to explain what they are doing, how they are doing it, etc. to the instructor. Students' academics are assessed and they are also asked to self-evaluate their progress at the completion of the project.

The specific objective measures of performance are:

1. **Achievement** which is a measurement of acquired skills through using tools, applying engineering concepts, and contributing in a team setting. This grade reflects what the student knows, understands, and can do at a given time relative to agreed upon goals. Achievement grades are reported throughout the term in Synergy and progress reports and solely define their grade on the official transcript.
2. **Habits of Mind** which is a measurement of the contribution a student makes to their own success. These included a student's perseverance, asking for help when needed, revising work to improve quality, setting and pursuing academic goals, accepting challenges and seeing issues from multiple perspectives. Habits of Mind grades are only reported in Canvas and aren't included in the calculation of a student's official grade in Synergy.
3. **Growth** which stems from evidence a student has or has not made measured progress toward agreed upon goals. Growth grades are only reported in Canvas and aren't included in the calculation of a student's official grade in Synergy.

Homework

While there may be an occasional reading assignment given in a handout, almost all of the work is done in-class. There may be times when students will have to put in extra time after school or during lunch to complete project hard deadlines.

Late Work Policy

For each assignment, students are given a "soft" and "hard" deadline. If students turn in a complete project by the soft deadline, they receive feedback on their project and gain the opportunity to make improvements. Projects submitted after the soft deadline may not receive feedback or a chance for improvements.

Extenuating circumstances will be dealt with on a case by case basis through direct communication with the teacher.