SPRINGFIELD PUBLIC SCHOOLS
Phelps Center for the Gifted
WINGS Program
(523-3327)

WINGS Major Instructional Goals
to develop the student's thinking skills
to develop the student's communication skills
to develop the student's understanding of self and others

UNIT SYLLABUS
ROBOTICS 101
Fall 2019

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I. Overall Concept of the Course

Robotic systems that are comprised of computer-controlled, reprogrammable, moveable machines are expanding the horizons of our world. People, using human intelligence and creative thought, can program these robots to explore deep space, mine other planets, do work that could be hazardous, search the ocean depths, and free us from repetitive tasks.
This Robotics course utilizes Lego EV3 software. Students will explore the theory, technique, and practice behind autonomous mobile robotic systems in order to navigate a specific set of obstacles. Students will also study simple and complex machines and incorporate social studies, math, and other variables into their work. The course uses hardware, software, and mechanical tools to investigate the issues and ideas associated with these systems, including robot design and construction techniques, software design, critical thinking, communications, and collaboration. Students will participate through research, lab work, and personal and group projects.

II. Rationale

1. When students design and build robots, they study math, science, engineering, and physics. Robotics education is an important integrator in education today. Students in this class are immersed in geometry, electronics, programming, computer control, and mechanics while using materials and software specifically designed for children.

2. Robotics projects reinforce the importance of time management and resource allocation. Students will be required to follow specific time guidelines when completing projects, as well as sharing building and programming responsibilities with a partner or small group.

3. Team projects in robotics are rooted in constructionist theory, which states that children learn best when actively engaged in hands-on projects that are meaningful and enjoyable.

4. Studying current and possible uses for technology creates a greater understanding and appreciation for early inventions, scientific theories and global awareness.

Robotics 101 is a course of study designed to meet the following needs of gifted students:

- the need for acceleration (the class includes physics concepts and computer programming not usually included in elementary/middle school studies.
- the need for sophistication of ideas (students will use higher level thinking skills to create a robotic machine driven by original programs
- the need to develop critical thinking skills and to solve problems in diverse ways (experimentation/revision based on results of experiments)
- the opportunity to encounter and use increasingly difficult vocabulary and concepts (robotics terms, programming languages)
- the need for interaction with intellectual peers (gifted students who have an interest in science and technology)
- the need to set realistic goals and accept setbacks (designing, building and programming robotic machines requires revising and improving projects)
- the opportunity to contribute to the solution of meaningful problems (problems that must be solved include design, technological, and programming problems)

III. Course Objectives

The student will demonstrate an ability to:

- Apply, analyze, and evaluate science concepts related to technology involved with robots and robotics
- Analyze and evaluate historical and cultural concepts and apply them to modern situations
- Use effective written and verbal communication skills to convey information
- Apply problem-solving strategies necessary to resolve conflicts associated with the programming and operation of robotic machines
- Synthesize robotic concepts necessary to create and to program robotic machines following written and/or verbal specifications
- Complete assigned tasks and demonstrate an ability to describe the task, both orally and in writing
- Acquire the social skills necessary to become a responsible team member

IV. Applied Thinking Skills

--To develop critical thinking skills the student will apply the skills of: asking and answering questions of clarification, making and judging observations, making and judging deductions, deciding on an action, and interacting with others.
--To develop creative thinking skills the student will apply the skills of: creative problem solving (problem finding, deferring judgment, considering alternatives, brainstorming).
--To develop analytical thinking skills the student will apply the skills of: comparing and contrasting, ranking, prioritizing, sequencing, hypothesizing, analyzing, inferring, evaluating, and predicting.

--To develop organizational skills the student will apply the skills of: interpreting data, formulating questions, goal setting, planning, designing, and decision making.

V. Applied Affective Skills

The student will apply decision-making skills, group dynamics skills, and communications skills to the task of solving problems and creating new products.

VII. The format of the class will include:

Socratic Method	Hands-on experiments
Demonstrations	Computer programming
Team building	Note-taking/discussion
Kagan Learning Method	Brainstorming/divergent thought
Computer-aided instruction	Construction
Convergent thinking/solutions	Learning new technologies

VIII. Assessments

- Performance Task: Build and program a robot that can move straight.
- Performance Task: Build and program a robot that can turn.
- Performance Task: Build and program a robot that can complete a maze.
- Performance Task: Build and program a robot that can use a touch sensor.
- Performance Task: Build and program a robot that can use a light sensor.
- Performance Task: Build and program a robot that can use an ultrasonic sensor.

IX. Resources to be used:

Software

- Lego Education EV3 software
- Carnegie Mellon Robotics Academy tutorials. www.cs2n.org

Online

- www.cs2n.org
- www.Education.lego.com
- www.destinationimagination.org
- www.teachengineering.org
- Discovery Education Streaming
- Brainpop