PTI### - Robotics Engineering
DoDEA Career Technology Education
COURSE SYLLABUS

I. COURSE NUMBER AND TITLE: PTI###, **Robotics Engineering**

II. CREDIT: 2 Semesters (1 Year)

III. PREPARATION: Students enrolling in this course will apply math and science to develop technology and engineering skill sets. The recommended preparation for this course is achievement or concurrent enrollment in Algebra.

IV. COURSE DESCRIPTION: The Robotics Engineering course teaches 9th through 12th grade students the engineering/design process using mechanisms, machines, and robotic systems. Students progress at their own pace while studying and performing tasks independently and in small groups. Hands-on activities supplemented with demonstrations, mentorship, and study trips familiarize students with the concepts and application of robotics technologies. Performing laboratory experiments, students will gain first hand knowledge of simple machines, fabrication, and logic systems. Students will also learn how to program complex robotic systems to perform a variety of interesting and useful tasks.

V. COURSE OBJECTIVES:

Upon completion of this course, students will:

1. Demonstrate safe behavior and practices in a laboratory environment.
2. Understand the history, social impact, and fundamentals of robot technology.
3. Identify mechanisms and explain their operation in simple machines.
4. Apply math and science to develop robotics solutions to design problems.
5. Apply the Engineering/Design Process to solve problems.
6. Practice troubleshooting techniques to resolve malfunctions.
7. Program robots to understand data acquisition, data handling, and conversion.
8. Employ voice recognition/synthesis, vision systems, and interfacing techniques.
9. Build models that simulate robots at work.
10. Investigate the Engineering Profession and Related Careers.
11. Conduct, develop, and present technical reports and a threaded case study.

VI. COURSE OUTLINE

1. Setting Expectations for Student Success
2. Relating Safety to Robotics Engineering
3. Investigating Simple Machines
4. Identifying the Elements of Structural Design
5. Applying the Engineering/Design Process
6. Understanding Robot Fundamentals
7. Investigating Electrical/Electronic Systems
8. Understanding Fluidic Power
9. Applying Motors and Actuators
10. Exploring Microcontroller Technology
11. Programming Microcontrollers
12. Applying Data Acquisition (Sensors)
13. Handling and Converting Data
14. Interfacing to the Microcontroller
15. Designing and Developing Intelligent Machines

VII. CURRENT RESOURCES:

Mindstorms NXT Base Set
Tetrix with Servo and DC Motor Controller
Mindstorms Education

NXT Software and User Guide
Mindstorms Education

RobotC Curriculum for Lego Mindstorms
Mindstorms Education
Carnegie Mellon Robotics Academy

RobotC Programming Language
Mindstorms Education
Carnegie Mellon Robotics Academy

Robotics Workbook
Robomatter, Inc.

Robotics Engineering Course
DoDEA Community Site
DoDEA CTE Curriculum Dev. Team

VIII. PREPARED: September 14, 2010

DoDEA – Career and Technology Education
Robotics Engineering Course - Scope and Sequence

Competency Area	Duration	Major Understanding	Activities / Assessments
Quarter One			
Setting Expectations for Student Success	.5 weeks	Students will demonstrate an understanding of the expectations for successful completion of Robotics Engineering course. Students will understand the history, social impact, and fundamentals of robot technology.	Pre-Test, Exercises Practicum Post-Test
Relating Safety to Robotics Engineering	.5 weeks	Students will demonstrate safe behavior and practices in a laboratory environment.	Pre-Test Exercises Practicum Post-Test
Investigating Simple Machines	4 weeks	Students will identify mechanisms and explain their operation in simple machines.	Pre-Test Exercises Practicum Post-Test
Identifying the Elements of Structural Design	4 weeks	Students will apply geometric design, materials, and fastening systems to structure fabrication.	Pre-Test Exercises Practicum Post-Test
Quarter Two			
Applying the Engineering/Design Process	1 week	Students will apply the Engineering/ Design Process to solve problems related to robotics engineering. Students will conduct, develop, and present technical reports and a threaded case study.	Pre-Test Exercises Practicum Post-Test
Understanding Robot Fundamentals	3 weeks	Students will apply math and science to develop robotics solutions to design problems.	Pre-Test Exercises Technical Report Practicum Post-Test
Investigating Electrical/Electronic Systems	3 weeks	Students will understand the nature of electricity and apply this knowledge of electronic components to circuit design.	Pre-Test Exercises Technical Report Practicum Post-Test
Understanding Fluidic Power	1 week	Students will understand the concepts of pneumatic and hydraulic systems.	Pre-Test Exercises Practicum Post-Test
Applying Motors and Actuators	1 week	Students will apply motors and control circuitry to develop actuator mechanisms.	Pre-Test Exercises Practicum Post-Test

Quarter Three			
Exploring Microcontroller Technology	1 week	Students will study the architecture of microcontrollers to interface with the real world.	Pre-Test Exercises Practicum Post-Test
Programming Microcontrollers	4 weeks	Students will program microcontrollers to operate basic robotic systems.	Pre-Test Exercises Technical Report Practicum Post-Test
Applying Data Acquisition (Sensors)	1 week	Students will apply sensors and design associated circuitry to collect data.	Pre-Test Exercises Practicum Post-Test
Handling and Converting Data	1 week	Students will program robots to understand data acquisition, data handling, and conversion.	Pre-Test Exercises Practicum Post-Test
Interfacing to the Microcontroller	2 weeks	Students will interface voice recognition/synthesis, vision systems, and interfacing techniques with a robot microcontroller.	Pre-Test Exercises Technical Report Practicum Post-Test
Quarter Four			
Designing and Developing Intelligent Machines	9 weeks	Students will build and program models that simulate robots at work using the Engineering/Design process. Students will practice troubleshooting techniques to resolve malfunctions.	Scenario-based Projects Threaded Case Study Capstone Project Competency Profile