

Robotics & Automation
.5 credit, Recommended for 10-12 grades
CIP Code 21.0117
USOE Course #38-01-00-00-130

COURSE SYLLABUS

INSTRUCTOR: Jim Baker

CLASS LOCATION: Room 118

OFFICE HOURS: 8:30 - 5:00 Mon. & Wed., 8:30 – 4:00 Fri.

OFFICE PHONE: 753-7377 Ext. 4300 HOME PHONE: 563-6689

E-MAIL ADDRESS: jbaker@intechchs.org

COURSE WEB PAGE: <http://www.intechengineering.org>

A. COURSE DESCRIPTION

Robotics & Automation is a lab based, hands-on curriculum combining electrical, mechanical and engineering principles. Students will learn to control and program robotic devices by applying science, technology, engineering and math. A rigorous study and application of electrical concepts will include, but are not limited to: sources of energy, electrical safety, use and identification of basic electronic parts, sensors and actuators. Mechanical concepts will include, but are not limited to: application of simple machines, mechanical design, prototype development, design testing, model assembly, programming control, and proper engineering documentation. Industrial automation, robotic applications and career opportunities will also be discussed.

B. METHOD OF INSTRUCTION

This is a lecture-lab course in which topics are presented by the instructor. Projects are explained and assigned, and are to be completed during lab periods and outside of class as needed. Students are required to maintain an Engineer's Notebook and Portfolio throughout the course with periodic checks. There is a comprehensive final exam given at the end of the course.

C. COURSE STATE STANDARDS

Standard 1: Students will be able to work with mechanical and electrical devices while demonstrating safe work practices.

Objective 1.1 – Use safe work practices

- a. Describe safety precautions and procedures pertaining to and working with electricity, mechanical design devices, and automated machinery.
- b. Describe correct safety procedures for hand and power tools.
- c. Locate and describe shop safety equipment.
- d. Apply safe work practices while working in a shop environment.
- e. Locate and identify hazards in the workspace.

Standard 2: Students will be able to use and identify basic electronic components and demonstrate appropriate applications.

Objective 2.1 – Use and apply electronic components to control mechanical devices.

- a. Identify electronic sources such as batteries, generators and solar cells and their applications.
- b. Identify and apply characteristics of basic series, parallel, and series parallel resistive circuits.
- c. Identify and apply switching concepts.
 - Motor reversing with mechanical switches
 - Motor reversing with electronic sensors and drivers
 - Transistors, operational amplifiers and basic logic circuits

Standard 3: Students will be able to identify and use electrical sources and make basic measurements to verify correct operations.

Objective 3.1 – Use batteries, solar cells and generators to provide energy for the operation of small motors and other mechanical devices.

- a. Convert light, chemical and mechanical energy into electrical energy.
- b. Recognize and identify appropriate uses of energy based on physical, environmental and special needs.
- c. Increase performance of electrical devices through series and parallel connections of energy sources.
- d. Demonstrate the ability to use math and science concepts to solve electrical design problems.

Objective 3.2 – Students will demonstrate correct use of a multimeter to make measurements for voltage, current and resistance.

- a. Students will make correct measurements pertaining to electrical sources.
 - The student will be able to safely measure currents of electrical sources and verify measurements with Ohm's law.
 - The student will be able to measure resistance of simple resistors and compare the results to the resistor color code.
- b. Students will make correct measurements pertaining to electrical loads.
 - The student will be able to measure current through a load verifying measurements with Ohm's Law.

- The student will be able to measure resistance and the effects of temperature changes on resistance in a dynamic circuit that uses a positive and/or negative temperature coefficient.
- The student will be able to use Ohm's Law to calculate simple series and parallel sources and loads.

Standard 4: Students will be able to operate motors, levers and pneumatic devices to perform mechanical tasks.

Objective 4.1 – Students will be able to identify and use levers, pulleys and gears to effectively perform a task.

Objective 4.2 – Students will be able to use problem solving and group design concepts to build a working model of an electromechanical device to perform a specific function, or set of functions.

Standard 5: Students will be able to apply sensors and actuators to control and limit motion of motors, levers and other mechanical devices.

Objective 5.1 – Students will apply electronic concepts of sensing specific environmental conditions such as light, heat, pressure, motion, voltage changes, and others.

Objective 5.2 – Students will apply electronic concepts to act upon the sensed changes in environmental conditions. After circuits have sensed environmental changes, circuitry should act upon the change and cause an appropriate action to occur in response to the change.

Objective 5.3 – Students will demonstrate the use of simple machines and show how they are used in structural design of complex devices and machines.

Standard 6: Students will explore and apply principles of the engineering design process.

Objective 6.1 – Students will learn and understand the steps of the engineering design process and be able to explain the activities that occur during each step.

Objective 6.2 – Students will apply the steps of the engineering design process to solve a variety of engineering problems.

Objective 6.3 – Students will demonstrate the use of simple machines and show how they are used in structural design of complex devices and machines.

Standard 7: Students will demonstrate sketching skills to enhance visualization.

Objective 7.1 – Students will demonstrate proper sketching techniques.

Objective 7.2 – Students will demonstrate the use of sketches in the development of ideas in the design process.

Objective 7.3 – Students will understand the purpose of documentation and record design development in an engineering notebook.

D. REQUIRED SUPPLIES

- Blue or Black regular ball point pens (No felt-tip or gel pens)
- 3" X 5" note cards for test notes

E. GRADING PLAN

- Homework = 20%
- Engineer's Notebook = 15%
- Projects = 35%
- Tests = 30%

The grading scheme will be as follows:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
93%	90%	87%	83%	80%	77%	73%	70%	67%	63%	<63%

F. COURSE SPECIFICS

- For all papers to be written, the following formatting standards apply:
 - 12 point Arial or Times New Roman font only. Arial is preferred.
 - Double space only. No other spacing will be accepted.
 - ALL margins are to be 1" (one inch) only.
 - Students should use a 3" x 5" single sided, handwritten note card for all tests.
 - Students should use an 8.5" x 11" sheet of notes (handwritten, single-sided) for use on the final exam. (Notes will be turned in with the test.) If a student misses a test because of an exempt or excused absence, the test may be made up the next day.

G. CLASSROOM RULES OF CONDUCT

- SAFETY -- Students will **ALWAYS** follow all safety rules. Violation of any safety rule will result in a three page safety report to be submitted and presented to the class.
- RESPECT -- Students will respect one another, themselves, the teacher, and the equipment by their actions, words and expressions.
- HONOR -- Students will honor other people's ideas and feelings. Students will honor the rules of the school.

H. ATTENDANCE POLICY

- LATE – Students not in their seat at the time of the late bell will be considered tardy which will be recorded in the school records.
- ABSENT – Students who have an unexcused absence will have any assignments, tests, or labs considered late under the assignment policy. Excused absences have two (2) class days to make up missing work.

I. RESOURCES INFORMATION

- All assignments, hand-outs and presentations are available on my school website including a copy of this syllabus.

Robotics & Automation Syllabus Affidavit

My signature below indicates that I have read and understand this syllabus and have been given instructions on where to locate additional copies online.

Student Printed Name

Student Signature

Parent Printed Name

Parent Signature

Please sign and return to the instructor.