

BugBrain™ CoursePak Information

Introduction to Robotics Standards and Benchmarks Grades 7-12

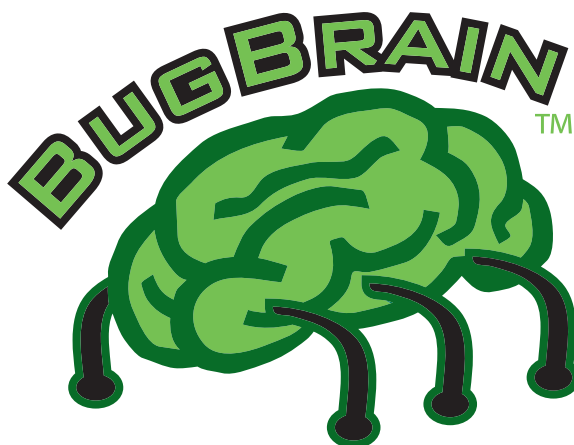
This class is an introduction to building and programming robots using Yost Engineering's BugBrain™ robot kits. Upon completion of this class, students will have built an autonomous walking robot and used a computer and programming software to make their robot interact with its environment.

The course includes a BugBrain™ robotics kit, BugBrain™ assembly manual, the student book "BugBrain 101," as well as a teacher manual, tests, and handouts. (Tools needed for assembly may be acquired with the Yost Engineering BugBrain Assembly Toolkit if not already available in the classroom.)



Standard Standards are general statements that identify the information students should know/understand and the skills they should attain as a result of their educational experience.	Benchmark Benchmarks describe what students should know and be able to do at developmental levels to demonstrate attainment of the standards.
Apply basic computer operations and concepts	<ul style="list-style-type: none"> Recognize and use common computer terms Demonstrate competent keyboarding skills Type, edit, and print sentences and paragraphs Organize directories, create, edit, copy, and move files Save files to disk, hard drive and local area network
Know the characteristics and uses of computer hardware and operating systems	<ul style="list-style-type: none"> Identify common components of a computer system Understand the nature of operating systems and the purpose of a graphical user interface Understand the characteristics of a microcontroller Recognize the pervasive use of computers and embedded computer systems (cell phones, automobile engine controls, ABS braking, television sets, radio-controlled toys, etc.) Understand the basic differences between software and hardware
Use mathematical skills to apply computer-related concepts	<ul style="list-style-type: none"> Explain binary numbers, and convert between "normal" base-10 numbers and binary numbers Explain hexadecimal numbers and convert between "normal" base-10 numbers, binary numbers, and hexadecimal numbers Understand how and why computers use binary numbers to store and manipulate data Understand how and why hexadecimal numbers are used in computer applications
Identify electronic and mechanical components and build an autonomous robot	<ul style="list-style-type: none"> Learn and demonstrate proper soldering techniques Follow the detailed BugBrain assembly manual instructions Identify the robot's components, including transistors, diodes, resistors, microprocessors, and capacitors Identify and describe the robot's input and output devices, including the hinge switches, LEDs, speaker, key switches, and serial connection Learn problem-solving as it relates to troubleshooting assembly and hardware problems

Standard	Benchmark
<p>Understand beginning software engineering concepts, and apply knowledge to write programs in a high-level, structured programming environment</p>	<ul style="list-style-type: none"> • Understand the concept of structured programming • Describe the characteristics of a high-level programming language • Explain what a compiler does • Enter sample programs and understand how they work • Learn to download programs from the computer to the robot • Demonstrate the ability to modify sample programs • Understand and use mathematical operators (addition, subtraction, multiplication, division, mod) • Understand and use relational operators (greater than, less than, equal to) • Understand and use logical operators (and, or, not) • Understand and use control structures (if/then, else, loop, for/next, select case, goto) • Understand the concept and use of variables (byte, integer, long, single, boolean, and string) • Understand how and why to use code comments • Understand how to implement sub-procedures and functions • Understand how to use the debug and print functions in BasicX • Understand the concept of frequency in the creation of sounds and notes • Learn problem solving as it relates to troubleshooting programming problems • Be able to write and compile software to make the BugBrain robot, walk, turn, back up, stop, play notes, turn on/off LEDs, etc. • Explain how the servo motors control the robot's movement • Understand and implement functions to control the robot's servo motors



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