

Introduction to Robotics

Day	Time	Goals Students will be able to...	Activities
1.1 Mon	Morning	<ul style="list-style-type: none"> Establish Positive social Bonds Understand appropriate behavior for classroom learning Demonstrate to the instructor where their strengths lie and what experience they have with robotics Connect course to real world/ 	<ul style="list-style-type: none"> Ice Breakers Norms/Rules: Course Expectations and Procedures. Review nonnegotiable class rules, collaborative group expectations, behavioral expectations, material procedures, computer usage. Sign computer use and CTY Honor Code forms. Pretest
	Afternoon	<ul style="list-style-type: none"> Make knowledge easily accessible. Build investment in course Understand step-by-step instruction writing process for programming Housekeeping. Reinforce Classroom norms. Understand to course theme of interactivity Understand and recognize what is defined as a robot. Establish journal expectations and Norms 	<ul style="list-style-type: none"> Journals. Discuss purpose of keeping a journal (as an engineer and in this course). Set up journals with table of contents. Discuss how to utilize journal for course. Number Pages, Set up Table of contents. What is a Robot? (Quick Write, Share out). Verb Names. Groups define robots based on observations, share definitions, and arrive at a class definition. Interactivity is introduced, and models use. input/output/processor/storage and programming should be introduced as well Get into groups. Inventory EV3 kit. Return extra pieces to extras box, make sure kits are complete Homework: Use worksheet to list and label the different parts of the EV3. Identify the different beams, pegs, motors (along with their inner workings), data wires, and explain their purpose. Read the chapter on parts exploration, as well as the basics to programming on the EV3 object-oriented platform.
1.2 Tues	Morning	<ul style="list-style-type: none"> Understand step-by-step instruction writing process for programming Understand to course theme of interactivity Understand and recognize what is defined as a robot. Reinforce Interactivity Understand some of the basic objects/programming blocks in programming environment Use appropriate vocabulary when referring to and using lego pieces Build a Positive Classroom Environment 	<ul style="list-style-type: none"> Continue Icebreakers Students complete Journal reflection for (Work Out One) Tricks and shortcuts - have the students start a tricks and shortcut page in the notebooks. Instruction-writing process: (Think it/Build it/Write it/ Repeat it) Discussion on elements of clear instructions. Class creates poster summarizing key elements (materials, sequenced instructions for every aspect of procedure, description of final result) View Clips on robots and real world footage (Mars rovers, industrial robots, etc.). What are the robots doing? input/output/processor/storage and programming should be introduced as well Journal: Notes on IOPS Challenge One – Simple Interactive Machine (Challenge1.doc) Students build a machine and write two programs.
	Afternoon	<ul style="list-style-type: none"> Make simple robots utilizing the motor, stop, wait for, touch sensor, and light sensor Build a Resource of gained knowledge 	<ul style="list-style-type: none"> Journal on challenge One Challenge 1 Presentations Disassemble bots Homework: Identify, draw, and explain each sensor (light/color, touch, ultrasonic, gyro, infrared and beacon) in detail. Give an example of how each sensor can be used. List a real-world application for each sensor, state where and how it is being used. Read the chapter on sensors in the textbook.
1.3 Wed	Morning	<ul style="list-style-type: none"> Verbalize and write about struggles they had with their robots today (mainly structural) Make simple robots utilizing the motor, stop, wait for, touch sensor, and light sensor icons 	<ul style="list-style-type: none"> Finish Building yesterday's bot. Tricks and shortcuts - have the students start a tricks and shortcut page in the notebooks. Think it/Build it/Write it/Repeat it Mysterbot: simple loop. Show students a mysterbot car that performs a very simple loop. In journals, have them describe in English what they think the program is, then

Day	Time	Goals Students will be able to...	Activities
		<ul style="list-style-type: none"> Reverse engineer a problem or task Build a sturdy robot frame Use and understand gears Build a robot to perform a useful task Get comfortable using EV3 programming platform and building robots 	<p>recreate the program. (The loop could be as simple as “go forward 5 rotations, stop, beep, repeat”.)</p> <ul style="list-style-type: none"> Present today’s challenge (Challenge2.doc) Prep for Lab #2 with Help_Quest1.doc. Discuss the answers with emphasis on the concepts of modifiers, loops, and conditionals Workout Two Begin Challenge 2
	Afternoon		<ul style="list-style-type: none"> Continue Challenge 2 Present Challenge 2 Journal Homework: State the difference between a simple gear train and a compound gear train. Calculate the exercise on simple and compound gear train. Research and record the definitions of torque, speed, and horsepower. Write down the mathematical formulation for each. Read chapter on gears.
1.4 Thurs	Morning	<ul style="list-style-type: none"> Understand the importance of structure, center of gravity, and good design in robot building Recognize the important aspects of robotics – trial and error, testing, observation, theorizing, programming, building, etc. 	<ul style="list-style-type: none"> Discuss the importance of structure, center of gravity, and good design in robot building Wheel rotation Activity (Torque, Degrees) Journal Work out #3 Journal
	Afternoon	<ul style="list-style-type: none"> Verbalize their understanding of robotics See a different perspective on programming by seeing others’ presentation Make simple robots utilizing the jump, loop, split task, and fork icons Verbalize and write about what worked and didn’t work within their partners (group-working skills) 	<ul style="list-style-type: none"> Challenge Three Journal Homework: Solve problems dealing with torque, horsepower, speed, velocity, and acceleration due to gravity. Research and record Newton’s three laws of motions; write explicit formulas where possible. Read chapter on control flow (loops [for, and while], nested-loops, statements [if, and cases]). Be familiar with terms such as, algorithm, pseudocode, source code, debugging, and flowchart.
1.5 Fri	Morning	<ul style="list-style-type: none"> Recognize the importance of attention to detail in robotics. Improve troubleshooting and debugging skills 	<ul style="list-style-type: none"> Finish work on Challenge Three Present Challenge Three Help Quest # 2
	Afternoon	<ul style="list-style-type: none"> Verbalize their understanding of robotics 	<ul style="list-style-type: none"> Work Out #4 Homework: Read textbook chapter on troubleshooting and debugging.
2.1 Mon	Morning	<ul style="list-style-type: none"> Verbalize and write about approach to robot design and programming using appropriate vocabulary 	<ul style="list-style-type: none"> Help Quest 3 Introduce Challenge Four through discussion of how to approach the task and collaboration.
	Afternoon	<ul style="list-style-type: none"> Interpret/analyze/and apply applicable information from text. 	<ul style="list-style-type: none"> Complete Challenge Four Read article on swarm theory from Science News (By Susan Milius May 9th, 2009; Vol.175 #10 (p. 16) “SWARM SAVVY How bees, ants and other animals avoid dumb collective decisions” - decentralized systems in nature) Webquest Homework: Explain the role of each parameter in a variable block and a Logic block. Explain what it means to write and then read a variable. Explain how a logic-controlled loop block can be used to implement a more sophisticated wait-for function. Write an EV3 program for a robot that uses a logic-controlled loop block based on the stored sensor readings from a variable block.
2.2 Tues	Morning	<ul style="list-style-type: none"> Make a robot that uses variables 	<ul style="list-style-type: none"> Discuss Programming Terms Discuss Feedback (Air Conditioning flowchart/Fireflies)

Day	Time	Goals Students will be able to...	Activities
		<ul style="list-style-type: none"> • Conceptualize the use of containers and sensors in factory robots • Build an immobile robot that serves a purpose 	<ul style="list-style-type: none"> • Introduce Challenge Five
	Afternoon		<ul style="list-style-type: none"> • Continued Challenge Five • Homework: Write an EV3 program for a robot incorporating multiple variables. Write an EV3 program for a robot that displays a variable on the EV3 screen.
2.3 Wed	Morning	<ul style="list-style-type: none"> • Build an immobile robot that serves a purpose • Build a robot that process feedback and adjusts accordingly. • Utilize all programming and building techniques learned so far in building a multi-purpose robot for an obstacle course 	<ul style="list-style-type: none"> • Complete Challenge Five • Journal on Challenge Five • Present Challenge Five
	Afternoon		<ul style="list-style-type: none"> • Introduce Challenge Six • Homework: Create an algorithm, and flowchart for the multi-purpose robot you built in class. Use EV3 objected-oriented language to describe both your algorithm and flowchart. Read the textbook chapter on advance programming concepts.
2.4 Thurs	Morning	<ul style="list-style-type: none"> • Use multitasking, variables, and other programming skills to model system behavior 	<ul style="list-style-type: none"> • Challenge Six
	Afternoon		<ul style="list-style-type: none"> • Challenge Six • Homework: Create an advance flow chart using computer science subroutines. Explain what decision block structures are, and how they are different from parallel branch structures.
2.5 Fri	Morning	<ul style="list-style-type: none"> • Use multitasking, variables, and other programming skills to model system behavior • Utilize all programming and building techniques learned so far in building a multi-purpose robot • Build a robot that process feedback and adjusts accordingly • Determine trade-offs in choosing which obstacle tasks to accomplish • 	<ul style="list-style-type: none"> • Present Challenge six • Mini Challenge (Art Bot)
	Afternoon		<ul style="list-style-type: none"> • Help Quest • Introduce P2P workout • P2P Workout • Present P2P Workout • Homework: Create a flow chart to describe your weekend routine (real or fictitious), including: all major behaviors labeled in blocks; at least two decision blocks; at least one sub-process lock which is used at least twice; start/end blocks wherever necessary; comments when necessary.
3.1 Mon	Morning	<ul style="list-style-type: none"> • Use multitasking, variables, and other programming skills to model system behavior • Utilize all programming and building techniques learned so far in building robot • Determine trade-offs in choosing which obstacle tasks to accomplish 	<ul style="list-style-type: none"> • Introduce Pinball Machine
	Afternoon		<ul style="list-style-type: none"> • Pinball Machine • Humanoid Challenge • Homework: Create a flowchart of the Humanoid challenge you built in class. Create modified flowchart adding at least two other subroutines that the Humanoid will be capable of demonstrating.
3.2 Tues	Morning	<ul style="list-style-type: none"> • Utilize all programming and building techniques learned so far in building robot 	<ul style="list-style-type: none"> • Humanoid Challenge
	Afternoon		<ul style="list-style-type: none"> • Humanoid Challenge • One Pager • Homework: Read section on Humanoid build. Write a program using computer science non-object oriented subroutines to illustrate a task the robot will do. Create a flow chart of that task using only higher level language programming terms.
3.3 Wed	Morning	<ul style="list-style-type: none"> • Utilize all programming and building techniques learned so far in building a multi-purpose robot 	<ul style="list-style-type: none"> • One pager
	Afternoon		<ul style="list-style-type: none"> • Rube Goldberg • Homework: Write up your speech for presenting your robot; include appropriate flowchart and algorithm. Be sure to highlight why you decided on your build, and what it is capable of doing.
3.4 Thurs	Morning	<ul style="list-style-type: none"> • Evaluate their instructor and TA 	<ul style="list-style-type: none"> • Rube Goldberg • Closing Ceremony presentation robots

Day	Time	Goals Students will be able to...	Activities
	Afternoon	<ul style="list-style-type: none"> • Demonstrate understanding of robotics at the end of the session 	<ul style="list-style-type: none"> • Posttest • Closing Ceremony presentation robots
3.5 Fri	Morning	<ul style="list-style-type: none"> • Utilize all programming and building techniques learned so far in building a multi-purpose robot for an obstacle course 	<ul style="list-style-type: none"> • Rube Goldberg • Organize Lego kits • Clean Up