

Introduction to Robotics
CTY Course Syllabus

Week/Day	Time	Goals Students will be able to...	Activities
1/1 Mon	Morning 9 – 11:00	<ol style="list-style-type: none"> 1. Understand appropriate behavior for classroom learning 2. Demonstrate to the instructor where their strengths lie and what experience they have with robotics 3. Understand step-by-step instruction writing process for programming 	<ol style="list-style-type: none"> 1. Discuss honor code and rules 2. Pretest 3. Interest inventory 4. Peanut butter and jelly activity
	Afternoon 12:00-2:30	<ol style="list-style-type: none"> 4. Use appropriate vocabulary when referring to and using lego pieces 5. Verbalize and write about what they learned in class today 	<ol style="list-style-type: none"> 5. Students explore help function of Mindstorms 6. Students explore building robots with lego pieces
1/2 Tues	Morning 9 – 11:00	<ol style="list-style-type: none"> 1. Understand and recognize what is defined as a robot. 2. Know and appreciate the three laws of robotics 3. Identify what comprises as input, output, and processing 	<ol style="list-style-type: none"> 1. Discuss robots and three laws of robotics 2. Basic review worksheet of yesterday's exploration 3. Discuss input/output/processing
	Afternoon 12-2:40	<ol style="list-style-type: none"> 4. Make simple robots utilizing the motor, stop, wait for, touch sensor, and light sensor icons 	<ol style="list-style-type: none"> 4. Inventor 1, inventor 2, touch sensor, light sensor programming exercises exploration worksheets
		<ol style="list-style-type: none"> 5. Verbalize and write about struggles they had with their robots today (mainly structural) 	<ol style="list-style-type: none"> 5. Continue explorations 6. Journal
1/3 Wed	Morning 9 – 11:30	<ol style="list-style-type: none"> 1. Understand the importance of structure, center of gravity, and good design in robot building 2. Build a sturdy robot frame 	<ol style="list-style-type: none"> 1. Discuss the importance of structure, center of gravity, and good design in robot building 2. Robot design activity
	Afternoon 12-2:40	<ol style="list-style-type: none"> 3. Use and understand gears to apply 	<ol style="list-style-type: none"> 3. Discuss gears 4. Sophisticated Interactive

Week/Day	Time	Goals Students will be able to...	Activities
		<ol style="list-style-type: none"> Build a robot to perform a useful task Get comfortable using Mindstorms and building robots 	<p>Machine robot challenge</p>
			<ol style="list-style-type: none"> Continue interactive machine challenge
1/4 Thurs	Morning 9 – 11:30	<ol style="list-style-type: none"> Recognize the important aspects of robotics – trial and error, testing, observation, theorizing, programming, building, etc. 	<ol style="list-style-type: none"> Continue interactive machine challenge
	Afternoon 12-2:40	<ol style="list-style-type: none"> Verbalize their understanding of robotics See a different perspective on programming by seeing others' presentations 	<ol style="list-style-type: none"> Present interactive machines
		<ol style="list-style-type: none"> 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) 	<ol style="list-style-type: none"> Jump, loop, split task, and forks programming exercise exploration worksheets Journal
1/5 Fri	Morning 9 – 11:30	<ol style="list-style-type: none"> Use and understand the structures in programming in Mindstorms Use robotics skills to do reverse engineering 	<ol style="list-style-type: none"> Discuss structures Observe a mysterybot and program another robot that performs identically
	Afternoon 12-2:40	<ol style="list-style-type: none"> Recognize the importance of attention to detail in robotics Improve troubleshooting and debugging skills 	<ol style="list-style-type: none"> Continue mysterybot Troubleshooting worksheet
		<ol style="list-style-type: none"> Make a robot that uses structures to follow a line path 	<ol style="list-style-type: none"> Line following robot challenge
2/1 Mon	Morning 9 – 11:30	<ol style="list-style-type: none"> Verbalize and write about approach to robot design and programming using appropriate vocabulary 	<ol style="list-style-type: none"> Continue line following robot challenge Write about line following robot approach
	Afternoon 12-2:40	<ol style="list-style-type: none"> Use and understand container icons Make a robot that uses containers to count the number of lines it passes 	<ol style="list-style-type: none"> Discuss containers Line count robot challenge

Week/Day	Time	Goals Students will be able to...	Activities
			5. Continue line count challenge
2/2 Tues	Morning 9 – 11:30		1. Complete line count challenge and demonstrate
	Afternoon 12-2:40	1. Conceptualize the use of containers and sensors in factory robots 2. Build an immobile robot that serves a purpose	2. Introduce ping-pong ball sorting challenge 3. Ping-pong ball sorting challenge
			4. Continue ping-pong ball sorting challenge
2/3 Wed	Morning 9 – 11:30		1. Complete ping-pong ball sorting challenge
	Afternoon 12-2:40	1. Verbalize their thought processes when programming and building 2. Recognize and address errors in robots 3. Understand the importance of torque and other physical design of robot	2. Present ping-pong ball sorting challenge 3. Discuss the importance of physical aspects of a robot 4. Discuss torque
		4. Use robotics skills to do reverse engineering	5. Students observe mysterybot and describe in journal
2/4 Thurs	Morning 9 – 11:30	1. Utilize all programming and building techniques learned so far in building a multi-purpose robot for an obstacle course 2. Determine trade-offs in choosing which obstacle tasks to accomplish	1. Begin obstacle course challenge preparations
	Afternoon 12-2:40		2. Continue obstacle course preparations
			3. Continue obstacle course preparations
2/5 Fri	Morning 9 – 11:30		1. Continue obstacle course preparations

Week/Day	Time	Goals Students will be able to...	Activities
			2. Set up obstacle course
	Afternoon 12-2:40	1. Have an opportunity to work with another robotics class and see different methods of attacking obstacles 2. Compete against another class to gain points depending on which obstacles they choose to accomplish	3. Obstacle course challenge against IROB-B, preliminary round
			4. Continue obstacle course challenge against IROB-B, semi-finals and finals
3/1 Mon	Morning 9 – 11:30	1. Identify and understand the role of input vs. output vs. processing of information 2. Identify and understand the role of software vs. hardware vs. firmware 3. Identify systems	1. Discussion on input/output, software/hardware, systems
	Afternoon 12-2:40	4. Use robotics skills to do reverse engineering	2. Observe a mysterybot and write an algorithm in journal
		5. Begin to understand the inside workings of a robot 6. Complete a circuit and create AND and OR gates	3. Begin circuits activity with
3/2 Tues	Morning 9 – 11:30	1. Use and Understand boolean algebra 2. Use AND and OR integrated circuits with boolean algebra to make applicable circuits	1. Continue circuits activity with
	Afternoon 12-2:40	3. Calculate torque 4. Build a robot with the consideration of torque 5. Build a robot that will do off-road racing	2. Discussion on torque 3. All-terrain robot challenge
			4. Bring students to Papua New Guinea Sculpture Garden to run all-terrain robots 5. Journal
3/3 Wed	Morning 9 – 11:30	1. Build and program a robot that will sumo wrestle another robot	1. Begin Sumo Bot challenge
	Afternoon		2. Continue Sumo Bot challenge

Week/Day	Time	Goals Students will be able to...	Activities
	12-2:40		
			3. Sumo Bot round robin and tournament
3/4 Thurs	Morning 9 – 11:30	1. Clean up and organize for next years class	1. Organize Lego kits
	Afternoon 12-2:40	2. Evaluate their instructor and TA 3. Demonstrate their understanding of robotics at the end of the session	2. Continue organizing Lego kits 3. SPEs 4. Post-Test 5. Pack up
		4. See what the future has in store for robotics 5. Perhaps be inspired to further their robotics studies 6. Ask questions of a robotics expert	6. SFSU speaker, David Calkins
3/5 Fri	Morning 9 – 11:30	1. Get a chance to demonstrate their newly acquired robot knowledge to an audience of CTY parents	1. End of the session celebration 2. Work on Closing Ceremony presentation robots