

Curriculum - Robo Intermediate (Level 2)



	Topics	Learning Outcome	Assessment %
1.0	Revision - Robo Beginners (Level 1)	Revision, Group discussion, Robot design strategy, Speed and accuracy	
	1.1 Robot components		
	1.2 Programming techniques		
	1.3 Construction techniques		
2.0	Introduction to Light sensor	Understanding of Electro-magnetic spectrum, frequency, wavelength, amplitude. Requirements for measurement standardisation and calibration. Use of Looping (WHILE-DO) and Switching (IF-THEN-ELSE) techniques.	
	2.1 Sensor operation and measurement techniques		
	2.2 Sensor mounting requirements and precautions		
	2.3 Sensor calibration		
	2.4 Sensor programming		
	2.5 Programming: Sequence Beam		
	2.6 Programming: Loop Block, Switch Block, and Nested Switch Blocks		
	2.7 Programming: Stop Block		
3.0	Robot design by team	Mechanical design and prototyping skills.	
	3.1 Center of Gravity consideration		
	3.2 Selection of Wheels and Tracks		
	3.3 Location of components (Motors, Controller, Wheels, Pickers, Arms, Sensors, 3.4 Rigidity and reliability		
4.0	Robot design analysis and proof of concept	Testing and analysis of mechanical design. Failure analysis and corrective action.	20%
5.0	Project - Use of Light Sensor	Practical use of Light sensor, including positioning, programing, testing, and analysis.	
	5.1 Sumobot		
6.0	Introduction to Levers, Cantilevers, Pulleys and Gears	Applications of levers and cantilevers. Understanding of force and torque. Gears/Pulleys and their uses, application of gearing techniques, changing speed, torque, and direction of rotation through gears.	
	6.1 Introduction to levers and cantilevers, force and torque.		
	6.2 Use of pulleys and gears in machines		
	6.3 Types of gears and their uses		
	6.4 Gear ratio and selection of gears/pulley wheels		
	6.5 Torque vs. Speed		
	6.6 Designing with Pulleys and Gears		
7.0	Project - Use of gears in picker design	Use of gearing for 3D object manipulation utilising single axis rotation.	10%
	7.1 Combination picker for grabbing and lifting balls and 4x4 blocks		
8.0	Experiment - Effects of gear ratio on speed and torque	Effects of gear ratio on speed and torque.	
	8.1 Effect on robot speed by varying gear ratio		
	8.2 Load lift capability of motor through varying gear ratios		
9.0	Introduction to Colour Sensor & Rotation Sensor	Operation and limitations of Colour sensor. Programming with Colour sensor. Color vs. Light.	
	9.1 Colour sensor operation and measurement techniques		
	9.2 Colour sensor mounting requirements and precautions		
	9.3 Colour sensor programming		
	9.4 Rotation sensor configuration		
10.0	Project: Use of Colour Sensor and Gears	Sorting and picking on Colour. Practical application of gears in robots.	20%
	10.1 Robot design to recognize and pick Blue coloured balls in it's path.		
11.0	Final Project: Flowchart and program for edge detection. Project presentation. (Student teams will work on this during the duration of the course)		50%