

An Engineering and Technology Program of Studies

Designing and Building a Robot Athlete

A Suggested Program Timetable

Week	Engineering Class Lectures/Demos	CAD/Eng Drawing	Lab Work	Assignment	Instructor/Manager	Milestones
	Notebook Requirement Explained Geometry Review Measuring mass, weight and density	Sketching and mockups 3 view theory	Shop safety and organization of materials/Supplies	Create a notebook/web page or slide show folder to contain all documentation.	Prepare Lecture and lesson plan objectives.	Each student has a 2", 3 ring binder, Class and lab facilities are inventoried and in order.
	GEARS –IDS Engineering Resources Identified and explained Mechanical Advantage, Simple Machines and Levers	Drawing tools or work station	Using tools safely Taps and dies	Complete the Geometry Worksheets	Demonstrate GEARS-IDS Components Create storage and organization systems	Define Competitive Machine Games Students can solve area, perimeter and volume problems
Week	Engineering Class Lectures/Demos	CAD	Lab Work	Assignment	Instructor/Manager	Milestones
	The engineering process Algebra Review Measuring speed and acceleration	Intro to CAD Drawing lines and objects Electronic symbols	Build a Motor Dynamometer Using the GEARS-IDS Kit	Measure personal horse power and create a personal efficiency evaluation spreadsheet	Develop Grading Criteria and rubrics Develop engineering challenge or	Game Defined Game Rules Playing field designed. Students can solve

					game Ideas.	mechanical advantage problems
Electric Motor Theory	Generating 3D Solids	Measure and graph motor torque and RPM	Create the playing field and game materials.	Prepare the fabrication area	Playing field constructed	Students know order of operations and can solve basic algebra problems
Newton's Laws						
Measuring force and torque						
Engineering Constraints	Assigning GEARS-IDS Components to be drawn. Create virtual kit of parts	Gear trains Chains and pulleys	Build a mobile robot chassis	Create Motor, Battery and Pneumatics demo's	Game Rules Published	Students can compute their own power output
Work, Power and Energy						
Battery specifications and capacity	Continue drawing components	Using a Multimeter	Discharge and plot AA battery discharge curve. Calculate total energy output	Create testing and demonstration modules for batteries	Students have completed mobile chassis	Students can solve basic force problems
Measuring Current, voltage and resistance.						
Electro Magnetism and Motors	Blocking: virtual "Mock ups" with 3D solids	Build a Fixed Magnet DC motor	Basic Electronics work sheet completed	Create Electronics storage and battery Charging Stations	Students can measure voltage, amperage, resistance and motor torque	
Evaluating DC circuits using Ohm's Law						
Pneumatics Force and Pressure	Draw the Pneumatic Component symbols	Test and evaluate a pneumatic module	Create and/or use a spread sheet to calculate pneumatic system performance		Mobile chassis engineered and Modeled in 3D.	Students can use Ohm's law to solve simple circuit problems
Boyle's Law						
Controlling actuators						

Disassemble and analyze Servo Gear system. Measure Servo Torque.	Model additional required mechanisms for game playing machine.	Wiring connectors and soldering/	Using digital communication and visualization tools to document the engineering process in your notebook	Create awards for winners	Functional or scoring components engineered and parts drawn. Student's can use Boyles law to solve basic pneumatic problems
Engineering Class Lectures/Demos	CAD	Lab Work	Assignment	Instructor/Manager	Milestones
Structural considerations using the kit components. Stress vs Strain and strength of materials	Model additional required mechanisms	Stress Strain worksheet	Reconfigure the servo. For 360 rotation. PWM Theory	Prepare materials for servo reconfiguring	Engineering drawings completed and in notebooks Students can solve torque problems
Forces and Friction Velocity and Acceleration	Determine weights/volume and density	Newtons Cart Experiments Friction experiments	Velocity, acceleration worksheets	Prepare materials for Newton's Cart Lab	Students produce stress strain graphs of a tested material
Wiring, batteries, motors and control systems	Dimensioning and detailing drawings	Create Schematic diagram of the electronic control system	Breadboard and operate the control system/sensors /speed controllers	Create control system breadboard for demonstration and lab work	Students can measure and calculate the acceleration of real world objects
Controls system basics. Sensors and programming	Pneumatic schematics				Mobile Chassis and control systems operational Students can calculate the coefficient of friction

WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK
WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	WORK WEEK	Machine built ready for test and debugging
Competition Week	Competition Week	Competition Week	Students provide written and graphic commentary demonstrating what the learned and are able to do. Machines are analyzed and students describe design revisions	Take video and or pictures of the competition and the competitors	Students review and evaluate each others notebooks	
Deconstruct Machine and Complete kit inventory and storage	Organize and complete assembly drawings and working drawings	Organize and complete notebooks	Turn in completed notebooks	Provide visual examples of a high quality notebook as a “Benchmark”	GEARS-IDS kits inventoried and organized. Note books completed	
Engineering Class Lectures/Demos	Graphics	Lab Work	Assignment	Instructor/Manager	Milestones	
Demonstrate and explain the process of creating a presentation outline or storyboard Demonstrate and explain presentation software	Presentation Software	Internet and Library Topic research Create an outline	Create a digital presentation about an academic (<i>Science, math, technology, history etc.</i>) topic that can be used by an elementary or jr. high school teacher to help teach an academic subject. Choose Subject	Provide Demonstrations and examples of the quality and scope of the expected deliverables	Create or obtain an example of a high quality presentation that will serve as a benchmark for student performance All students choose a subject	

	<p>Demonstrate and explain Digital Imaging using scanners and digital cameras</p>	<p>Digital Imaging Software</p>	<p>Creating and collecting Images</p> <p>Internet and Library Topic research continues</p>	<p>Create a digital presentation about an academic topic that can be used by an elementary or jr. high school teacher to help teach an academic subject</p> <p>Choose and inventory images</p>	<p>Provide Demonstrations and examples of the quality and scope of the expected deliverables</p>	<p>All images and artwork are collected and reviewed.</p>
	<p>Work Week</p>	<p>Work Week</p>	<p>Work Week</p>	<p>Work Week</p>	<p>Presentation grading rubric is developed.</p> <p>Presentations should clearly demonstrate what a child knows and is able to do.</p>	<p>Slide shows are completed and presented to the class. These presentations are then collected and burned to discs and distributed to elementary and secondary teachers throughout the district.</p>