

CIT Engineering I Curriculum Map

Month	Days	Description	Labs	Engineering Tech Standards
Unit I - Team Building				
Aug	1	Trio Interviews and Introductions		6.3, 6.4
	2	Camel Exercise - Develop a Seat for C1PTV		6.3, 6.4
	3	Steal My Fish and Key Punch - activities to work as a large group. Communication and highlight how attitude can affect team	x	6.3, 6.4
	4	Lego Hotels - communication activity for teams	x	6.3, 6.4
	5	Australian Trolleys and Tarp Flip - team physical activities of collaboration	x	6.3, 6.4
	6	Time Machine and Blind Geometry - solving problem activities as a group	x	6.3, 6.4
Unit II - Engineering Design Process				
	1	Engineering notebook setup and rubric, introduction to engineering design process		1.1, 1.6, 6.1
	2	Paper tower challenge intro and brainstorm (initial investigation)	x	2.1, 2.2, 2.3, 2.4, 4.4
	3	Paper tower challenge design and prototype	x	2.3, 2.4, 2.5, 2.6, 2.7, 4.4
	4	Paper tower challenge testing and evaluation	x	2.7, 2.8, 4.4, 6.1
Unit III - Center of Mass and Tipping				
	1	Center of mass, balancing and tipping exploration and discussion		2.2
	2	Corel Draw introduction - designing and drawing in Corel Draw	x	5.4
	3	Balancing Bob project - design in Corel Draw	x	2.3, 2.4
	4	Laser cutting - setup, safety, and procedures	x	5.5, 5.6, 5.7
Sept	5-6	Balancing Bob project - prototype and testing	x	2.4, 2.5, 2.6, 2.7
	7	Balancing Bob - evaluation, gallery walk through and communication		2.7, 2.8
Unit IV - Perspective Technical Drawing				
	1	Orthographic view introduction with legos		
	2	Create orthographic view of model and reassemble	x	
	3	Introduce constant velocity project (constraints and criteria). Brainstorm ideas and design.		2.2, 2.3, 2.4,
	4	Isometric view introduction with legos		
	5	Creating isometric view with holes, chamfers and fillets	x	
	6	Measure dimensions of length, width, height, and diameters of real life objects using calipers	x	5.1, 5.2, 5.3
	7	Constant velocity project - design (isometric) and prototype	x	2.2, 2.3, 2.4, 2.5, 2.6
	8	Constant velocity project - Corel Draw design and laser cut	x	2.6, 2.7, 5.6
	9-10	Constant velocity project - testing and redesign	x	2.6, 2.7
	11	Constant velocity project - evaluation		2.8, 6.1
Unit V - Designing in SolidWorks				
	1	Introduction to CAD - SolidWorks		1.6

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	2	Creating a 2D drawing and dimensioning	x	5.4
	3	Creating a 2D drawing with relations	x	5.4
	4	Pros and cons of relations vs dimensions - deleting relations, fully defining a part	x	5.4
	5-6	Practice 2D drawing exercises	x	5.4
	7	Creating a 3D model - extrusions boss/base and extrusion cut	x	5.4
Oct	8-9	Practice 3D models - basic extrusions	x	5.4
	10	Creating a 3D model - revolves and patterns	x	5.4
	11-12	Practice 3D models - revolves and patterns	x	5.4
Unit VI - Acceleration				
	1	Introduction to bottle rockets - criteria, discussion, and demo		1.1, 1.2, 1.6
	2	Stable flight path - CM and CP demo and discussion		4.2
	3	Design bottle rocket in SW	x	2.2, 2.2, 2.3, 2.4, 5.2, 5.4
	4	Creating a drawing in SW and transfer to Corel Draw for cutting out fins on laser	x	2.5, 2.6
	5	Drill press safety and creating a Robinson coupling	x	5.5, 5.6
	6-9	Prototyping 4L bottle rockets	x	2.5, 2.6
Nov	10-11	Testing 4L bottle rockets	x	2.7
	12	Calculating height of bottle rocket using kinematics		1.6, 3.1, 3.5, 4.2
	13	Intro to trigonometry and calculating bottle rocket height using trig		1.6, 3.1, 3.5
	14	Evaluation of 4L bottle rockets	x	2.7, 2.8, 6.1
	15	Analyzing acceleration of 4L bottle rockets using video analysis		1.6, 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 4.2
Unit VII - Projectile Motion				
	1	Introduction to projectile launchers - types, criteria, and research		1.1, 1.2, 1.6, 2.1, 2.2
	2	Difference between accuracy and precision discussion, design ideas, and research of projectile launchers and energy sources in regards to materials used.		4.4, 5.1
	3-4	SolidWorks design of projectile launcher and safety and proper use of compound miter saw and band saw	x	2.3, 2.4, 5.4
	5	Safety and proper use of cordless power drills including making a pilot hole and fastening wood together.	x	5.5, 5.6
	6	Project management - discuss and create GANTT charts.		7.1, 7.2, 7.3
	7-12	Construct projectile launchers, test, problem solve, and iterate	x	2.5, 2.6, 2.7, 5.6
	13	Test projectile launchers. Collect data. Display data in chart to predict launches.	x	2.7, 2.8, 3.2, 3.3, 3.4
Dec	14	Calculate velocity vector of projectile when released from launcher using data collected from launches		1.6, 3.1, 3.5, 3.6, 3.7, 4.2

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	15	Demonstrate and evaluate projectile launchers effectiveness	x	2.7, 2.8, 6.1
Unit VIII - Static Structures (Bridges)				
	1	Discover best process to fastening noodles together to create a 3D structure	x	2.1, 2.2, 2.3, 2.4, 4.2, 4.4
	2	Construct a 3D structure with 20 noodles max. Discuss ideas, failures, and successes.	x	2.5, 2.6, 2.7, 4.4
	3-4	Define bending and the cause of structural weakness. Introduce bridges and have students research their purpose and how the 4 major types work, create a slide show with proper citations.		1.1, 1.2, 1.3, 4.2, 4.4
Jan	5	Discuss and demo trusses and why they create a rigid structure		1.1, 1.2, 3.3, 4.2, 4.4
	6	Pasta bridge project criteria and brainstorm. Design trusses using elevation view with a scale of 1:1.	x	2.1, 2.2, 2.3, 2.4, 4.2
	7-10	Construct bridge according to engineering/design plans	x	2.5, 2.6, 2.7, 4.2
	11	Test and evaluate bridges	x	2.7, 2.8, 3.3, 4.2
Unit IX - Dynamic Structure (Mousetrap Cars)				
	1	Discover and describe how a mousetrap works. Discuss safety and points of failure. Diagram and label a mousetrap. Describe how a mousetrap car works.		4.4
	2	Demonstrate and discuss a mousetrap car's mechanics. Identify points of friction. Theoretically calculate revolutions of axle under power.		1.6, 3.1, 3.5, 3.6, 3.7, 4.4
	3	Expand calculations to include distance mousetrap car will travel under power - practice calculations.		1.6, 3.1, 3.5, 3.6, 3.7
	4-5	Discover torque and the relationship between radius and force. Graph force vs radius and generate mathematical relationship. Describe how to modify hammer and results from modification.	x	1.6, 3.1, 3.2, 3.3, 3.6, 3.7, 4.1, 4.4
	6-7	Introduce mousetrap car 400 project (criteria and constraints). Design parts of mousetrap car in SolidWorks (base, frame, wheels, axles, bushings, hook)	x	2.1, 2.2, 2.3, 2.4
	8-9	Assemble a model using SolidWorks	x	2.5, 5.4
	10	Assemble mousetrap car in SolidWorks	x	5.4
	11	Create part using 3D printer	x	2.5, 5.2, 5.3, 5.4, 5.7
Feb	12-20	Prototype mousetrap car, test, problem solve, reiterate	x	2.4, 2.5, 2.6, 2.7, 5.2, 5.3, 5.4, 5.7
	21	Test and evaluate mousetrap cars	x	2.7, 2.8, 6.1
	22	Calculate theoretical distance and force. Compare results to actual data collected from testing.		3.1, 3.5, 3.6, 3.7
Unit X - Momentum-Impulse Theorem				
	1	Define, describe and calculate impulse and momentum using the impulse momentum theorem		1.6, 3.1, 3.5, 4.2, 4.3
	2	Discuss crumple zones and why these are effective according to the impulse momentum theorem. Relate crumple zones to today's technology in cars.		1.2, 1.3, 1.4, 1.5, 1.6, 4.4

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	3-4	Introduce egg crash vehicle project (criteria and constraints). Brainstorm ideas and test different ideas (play with materials).	x	2.1, 2.2, 2.3, 2.4, 4.4
	5	Design egg crash cars.	x	2.4, 2.5
	6-9	Prototype, test, problem solve, and iterate using egg crash car testing apparatus.	x	2.4, 2.5, 2.6, 2.7
Mar	10	Evaluate performance of egg crash vehicle.	x	2.7, 2.8, 6.1
	11	Calculate final velocity and force of impact using data collected from video analysis		1.6, 3.1, 3.2, 3.5, 4.2, 4.3
Unit XI - Electricity (Series Circuits)				
	1	Define voltage, current and resistance using a water model and rush hour traffic analogy. Use simulations to build electrical principles.		1.1
	2	Measure the resistance of different resistors and objects using a multimeter	x	5.1, 5.2, 5.3, 5.5, 5.6
	3	Read a resistor and measure for accuracy and tolerance. Describe an LED (light emitting diode) and how it works.	x	5.1, 5.2
	4	Create several circuits using a breadboard, LED, battery, and wires. Measure voltage.	x	5.2
	5-6	Determine the mathematical relationship between voltage, current and resistance (Ohm's Law)	x	3.1, 3.2, 3.3, 3.5, 3.6
	7	Create a circuit with a variable resistor (potentiometer and photoresistor). Measure and calculate current and power of circuits. Create a VIRP chart.	x	3.1, 3.2, 3.3, 3.5, 3.6, 4.1, 4.3
	8-9	Use simulator to create a series circuit. Discover the mathematical relationship of voltage, current, and resistance in a series circuit.	x	3.1, 3.2, 3.3, 3.5, 3.6
	10	Calculate each components V, I, R, and P in a series circuit.		3.1, 3.2, 3.3, 3.5, 3.6, 4.1, 4.3
	11-12	Introduce LED sign project (criteria and constraints). Design plexiglass sign to be engraved and cut.	x	2.1, 2.2, 2.3, 2.4
	13	Create circuit for LED sign, test and calculate power.	x	2.4, 2.5, 2.6, 2.7, 4.1, 4.3, 5.2
	14	Design LED holder to be 3D printed.	x	2.4, 2.5
Apr	15-17	Assemble, test, problem solve, and reiterate.	x	2.6, 2.7
	18	Evaluate LED sign with a gallery walk-through.		2.8, 6.1
Unit XII - Electricity (Parallel and Compound Circuits)				
	1-2	Use a simulator to create a parallel circuit. Discover the mathematical relationship of voltage, current, and resistance in a parallel circuit.	x	3.1, 3.2, 3.3, 3.5, 3.6, 4.1
	3	Create a parallel circuit with resistors and measure the voltage. Create a VIRP chart.	x	3.1, 3.2, 3.3, 3.5, 3.6, 4.1, 4.3, 5.2
	4-5	Solve compound circuits to determine the total and individual VIRP.		3.1, 3.2, 3.3, 3.5, 3.6, 4.1, 4.3
	6	Discuss sustainability and the use of LED lighting vs traditional filament lighting. Research sustainable features.		1.2, 1.3, 1.4, 1.5

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Month	Days	Description	Labs	Engineering Tech Standards
	7	Share sustainable practices in home construction. Break down passive solar heating, the sun and our local location.		1.4, 1.5
	8	Calculate overhang of roof to encourage solar passive heating.		3.1, 3.2, 3.3, 3.5, 3.6
	9	Introduce Sustainable Home project (criteria and constraints).		1.5
	10-11	Design house and compound circuit	x	1.5, 2.1, 2.2, 2.3, 2.4
	12	Calculate roof overhang and VIRP for compound circuit		3.1, 3.5, 4.1, 4.3, 5.2
May	13-23	Create a project management GANTT chart. Create model home using lab tools and wire house to include LED lighting	x	2.4, 2.5, 2.6, 2.7, 6.3, 7.1, 7.2, 7.3, 7.5
	24	Evaluate sustainable house project. Present house to peers		1.5, 2.8, 6.1, 6.2, 7.5, 7.6
Unit XIII - Mechanical Movements				
	1-2	Define mechanical advantage. Demo mechanical advantage with simple machines. Measure mechanical advantage using K'Nex machines	x	3.2, 4.3
	3	Introduce mechanical movements project (criteria and constraints). Choose a mechanical movement and model parts in SolidWorks.	x	2.1, 2.2, 2.3, 2.4
	4-10	Prototype, test, problem solve, and iterate mechanical movement.	x	2.4, 2.5, 2.6, 2.7
	11	Evaluate mechanical movement		2.8, 4.3
<p>126 out of 167 (scheduled) days working with technology, SolidWorks, shop tools, and 3D printers. 75% of time will be spent in labs.</p>				