Flight Science
CTY Course Syllabus

DAY	PERIOD	WHAT (skills, goals, knowledge, concepts, readings)	HOW (activities, demonstrations)
Day #1 (Monday)	**Morning**	→ Introduction → CTY Honor Code and Computer Policy → Class Rules → Science Journals → Units, Measurements, and Conversions	→ Classroom Introductions and Icebreakers → Measure various objects and convert units
	Afternoon	→ Technical Reporting → Pre-Assessment	→ Technical Report #1: How to make a Peanut Butter and Jelly Sandwich
	Late Afternoon	→ Paper Airplane Design Parameters and Flight Performance → Paper Airplane Construction and Testing	→ Class Discussion → Students created airplanes from paper airplane book or their own designs (Report #2: Paper Airplanes)
Day #2 (Tuesday)	**Morning**	→ Class discussion of paper airplane results → Brainstorming activities → Vectors and Navigation → Introduction to kinematics: speed	→ Brainstorming individually and as a team. Students had to make a list of ways to knock a ping pong ball off a table without touching it. Also designed a solution to a "fantastic contraption" → Outdoor vector activity → Outdoor running activity

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	Afternoon	→ Kinematics → Read CGTP Ch.1	→ Students determined speeds of hot wheels cars rolling down a ramp (Report #3: Kinematics) → Link to vectors; acceleration
	Late Afternoon	→ Newton's Laws → Read CGTP p. 18-32, 53-58 → Terminal velocity → Link Kinematics and Forces	→ Numerous demonstrations using common classroom items
Day #3 (Wednesday)	**Morning**	→ Basic Concepts of Flight (Vocabulary) → Basics of flight control and motion	→ Students fill out vocabulary sheet as instructor describes components using PowerPoint → Students construct Whitewings glider → Instructor uses flight simulator or r/c plane to demonstrate control surface motion
	Afternoon	→ Four forces of flight → In depth: Weight	→ Students identify how changes in four forces affect motion of an airplane → Weight and balance activity
	Late Afternoon	→ Stability	→ Demonstration of negative, neutral, and positive stability using hot wheels cars → Students determine the design characteristics of their gliders that promote stability

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Day #4 (Thursday)	**Morning**	→ Recap of all lessons → In depth: Lift → Finding Lift and Drag on Glider	→ Video of Coanda Effect → Students take measurements using their Whitewings glider
	Afternoon	→ Glide Ratio → Wing Planforms: Wing area, Wing Loading, Taper, Aspect Ratio	→ Students calculate glide ratio of their Whitewings → Students measure Wing area of scale wings, Wing loading of a Cessna 172 and Piper Arrow → Video of Boeing 777 Ultimate wing loading test → Demonstration of Taper
	Late Afternoon	→ Apply wing planform concepts	→ Students construct a "new" glider identical to whitewings glider except with a student designed wing planform to compare performance
Day #5 (Friday)	**Morning**	→ Recap of Lift → In depth: Drag → In depth: Thrust	→ Discussion of parasite and induced drag → Students start writing Report #4: Comparison of Gliders with Various Wing Planforms → Begin construction of a rubber band powered aircraft
	Afternoon	→ Flight Testing	→ Students trim and gather data for their "new" glider

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(Sunday)	**Late Afternoon**	→ Flight control and motion → Visit Science & Engineering (SCEN) bridge busting demonstration	→ Demonstration using instructor's radio controlled aircraft- students identify four forces during stalls, banks, loops, etc. → Students learn about structural rigidity and strength to weight ratio
Day #6 (Monday)	**Morning**	→ Finish Report #4: Comparison of Gliders with Various Wing Planforms → Begin Construction of rubber band powered aircraft	→ The report required the students to justify the design of the wing of the new glider. They needed to explain their procedures, results, and conclusions. → Students constructed rubber band powered aircraft using kits with balsa wood and tissue paper.
	Afternoon	→ Continued rubber band plane construction	→ Continued rubber band plane construction
	Late Afternoon	→ Continued rubber band plane construction	→ Continued rubber band plane construction
Day #7 (Tuesday)	**Morning**	→ Continued rubber band plane construction	→ Continued rubber band plane construction
	Afternoon	→ Continued rubber band plane construction	→ Continued rubber band plane construction
	Late Afternoon	→ Expand on Report #4:	→ Students who finished their rubber band powered plane early were asked to find the lift and drag on their gliders using formulas
Day #8 (Wednesday)	**Morning**	→ Field Trip	→ Field Trip
	Afternoon	→ Field Trip	→ Field Trip

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	Late Afternoon	→ Field Trip	→ Field Trip
Day #9 (Thursday)	**Morning**	→ Recap of Field Trip → Building PowerPole electric aircraft → Testing of Rubber band powered planes	→ Students were asked to write about one airplane, exhibit, or display they liked. They had to write what they learned and how it related to the content of the course. → Students were placed into teams of two and given the freedom to use the provided materials to derive their own designs as long as they were properly justified
	Afternoon	→ Building PowerPole electric aircraft	→ Continued Construction
	Late Afternoon	→ Testing PowerPole electric aircraft	→ Teams finished their models and began to do some rough testing (ie "can it fly?")
Day #10 (Friday)	**Morning**	→ Egg Drop – instructions, brainstorm, and design	→ Students given instructions and a budget to "buy" parts to construct a cradle to support an egg as it is dropped from three different heights. Students were paired with members of the Science and Engineering (SCEN) course to brainstorm and design their containers. Students were asked to present their designs to the class.

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	Afternoon	→ Egg Drop - Testing	→ Students containers were dropped from a second floor window. The survivors were dropped from a third story window and then a fourth floor.
(Sunday)	**Late Afternoon**	→ Space Shuttle Launch	→ Combined with SCEN and CPOL to watch the launch of Endeavor → Discussion of history of space exploration and previous shuttle missions
Day #11 (Monday)	**Morning**	→ Begin Report #5: Electric Aircraft → Testing PowerPole electric aircraft	→ Students were asked to determine the relationship between a design parameter (propeller blades, elevator postion, cargo weight/position) and performance (speed, altitude, stability)
	Afternoon	→ History of Rockets → Introduction to Rocket Science	→ Lessons and images of early rocket designs → Lessons, images, and demonstrations of fundamental rocketry and orbits
	Late Afternoon	→ Altitude tracker construction	→ Students made a device to measure the height traveled by a rocket → Students tested their trackers and compared results for three different pressures of a water bottle rocket
Day #12 (Tuesday)	**Morning**	→ Water bottle rocket construction	→ Water bottle rocket construction

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	Afternoon	→ Water bottle Rocket Construction	→ Water bottle rocket construction
	Late Afternoon	→ Water bottle rocket construction	→ Water bottle rocket construction
Day #13 (Wednesday)	**Morning**	→ Rocket Science II → Final Project proposals → Begin Report #6: Water Bottle Rockets	→ Discussed and watched videos of launch vehicles and staging → Size and scale of universe- demonstration of powers of ten, activities using scientific notation
	Afternoon	→ Water bottle rocket testing	→ All students tested their own bottle rockets
	Late Afternoon	→ Water bottle rocket experiments	→ Two part experiment: First the optimal air/water ratio to achieve the greatest altitude was found. Second, the pressure was varied to determine the effect on altitude. Students interpreted and concluded on the results
Day #14 (Thursday)	**Morning**	→ Post- Assessment → Final Project	→ Final Project
	Afternoon	→ Final Project	→ Final Project
	Late Afternoon	→ Final Project	→ Final Project
Day #15 (Friday)	**All day**	→ Final Project Presentations	→ Final Project Presentations