Course Expectations For Rocketry

Instructors:

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General Requirements:

* Prerequisite:   Chemistry – at proficiency
* Co-requisite: Algebra 2
* Grades: 11 & 12
* Length: 1 Semester

This course will focus on three major themes:

1. The aerodynamic design of objects in flight, and why rockets look the way they do. Students will build paper rockets.
2. The chemistry that represents the energy of a rocket system, potential and kinetic, including solid and liquid motors. Students will utilize pre-made solid-state rocket motors.
3. The mathematics that estimates a rocket's flight potential and flight path, both in and out of atmospheric flight. Students will design rockets to complete an **ultimate goal: of 0.5kg payload and 1 km height**.

Proficiency Grading

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| --- | --- |
| Score | Definition |
| 4 | **Exceeding –** You demonstrate knowledge and skills that surpass the standard. |
| 3 | **Proficient –** You demonstrate knowledge and skills that encompass the standard. |
| 2 | **Approaching –** You demonstrate basic knowledge or skills, but your work is often inconsistent or inaccurate. |
| 1 | **Beginning –** You demonstrate some knowledge or skills, but you have significant learning gaps. |
|  | You have made no attempt to demonstrate No knowledge or skills on this standard. |

 Learning targets are identified in each unit, and students will be assessed in each learning target using the above 4-point scale. Letter grades will be determined using the proficiency conversion chart designed by the district.

Students will be evaluated from many different angles in terms of collaboration, notebook organization, classroom discussion participation, and online forum contribution.

Course Expectations

You can expect Us:

* To start and end class on time.
* To reply to e-mails as promptly as possible
* To assign work that adequately covers the material and meets the learning objectives of the course while adhering to the time expectations throughout the course.
* To provide assessments that accurately reflect the material covered in class and assigned as homework.

**Please have parents/guardians sign/date here:**

We can expect you:

* To come to class on time.
* To be attentive and engaged in class.
* To maintain an active academic dialogue with your colleagues.
* To spend an adequate amount of time on the class work each week, making an effort to solve and understand each problem.
* To engage with both the abstract and computational sides of the material.
* To seek help when appropriate

**Rocketry Proficiency Statements:**

1. I can ask questions and define problems in the scientific context.

2. I can develop and utilize models to reflect various situations.

3. I can plan and carry out investigations to solve a problem.

4. I can analyze and interpret data in context.

5. I can use mathematics and computational thinking in context.

6. I can construct explanations and design solutions in real-life applications.

7. I can engage in an argument from evidence collected.

8. I can obtain, evaluate, and communicate information to collaborators effectively.

**NGSS Standards:**

* HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
* HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
* HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
* HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
* HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
* HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
* HS-PS2-1. Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
* HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
* HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision
* HS-PS2-4. Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.
* HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

**Guiding Questions:**

Week 1 – Aerodynamics: How does an object fly? (Thrust, Lift, Drag)

Week 2 – Newton’s Laws: How can we model a rocket’s trajectory?

Week 3 – Fuel: What makes a rocket move?

Week 4 – Impulse: How can we determine rocket thrust?

Week 5 – Recovery: What considerations do we need to recover our rocket?

Week 6-18 – Launch: What are the necessary items needed to build an effective rocket?