

Applied Project Based Physics: Research and Development

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Course Description: This course will focus around specific topics in physics that will be investigated using a three prong approach. 1) Students will understand and be able to manipulate general physics equations related to the topic. This content will be from an AP physics B (Trigonometry based) text book. 2) The students will formulating a hypothesis and construct a proposal for creating a testable machine. The machine will be created (using allotted time) and tested against the hypothesis (e.g. distance traveled for a catapult; dB reading increase for a tuned speaker box vs. stand alone woofer). 3) A written lab report will conclude the project and solidify the student's understand of each topic investigated. The following possible topic areas of focus are:

Green Energy:

- Biodiesel
- Solar panel creation
- Energy efficiency

Trajectory:

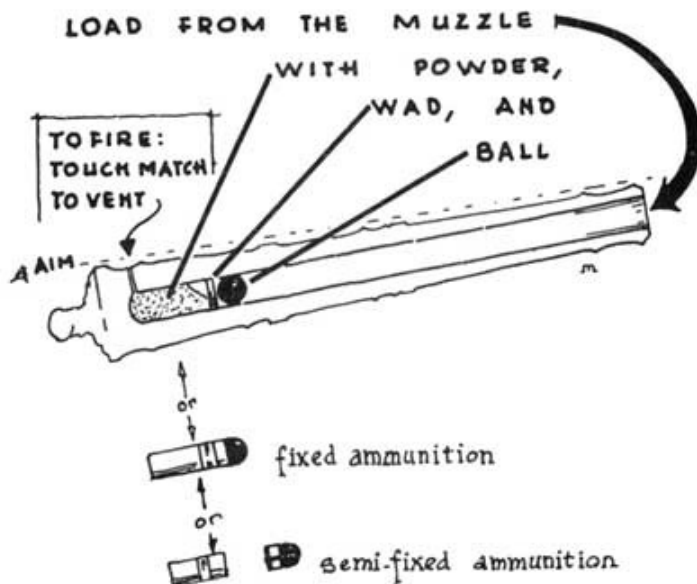
- Catapult trebuchet
- Air Cannon
- Black powder cannon

Sound and Amplification:

- Sound chambers
- Speaker design

Frequency Modulations

- Long Range Acoustic Device
- Frequency Jammers
- Air raid sirens



The Salisbury School Honor Code: All work bearing your name implies that you did not receive unauthorized assistance. This includes and is not limited to: exams, quizzes, lab reports, projects, and some homework activities. There will be some class, group and workshop activities that are excluded from this rule.

Four main class rules:

1. **Have all materials* everyday.**
2. **You are responsible for all items posted on the internet.**
 - a. **www.drjdegan.com**
3. **Make sure your area is clean before leaving.**
4. **The three negatives:**
 - a. **NO shouting, or calling across the room.**
 - b. **NO computers during class (unless requested by me).**

- c. NO phones, ipods, or games during class.

Two main lab rules:

1. No rough play in the lab.
2. Never leave a mess.

Materials* needed everyday:

- A clasp folder for paper transport
 - Should contain all previous work
- Writing utensil
- Calculator:
 - Coordinate your calculator requirement with your math materials

Expectations & Assessments

30% Home work / Class work

You are responsible to keep all the material I give you in a portable clasp folder. You must put your *name* at the top, *date*, and keep all handouts *in order*. I will give you a table of contents (TOC) coversheet (~ every 5-10 school days) for you to assemble a packet to turn in for grading. Packets will be graded and returned to you as soon as possible. Upon return, packets will then be placed in the 3-ring binder that is on the bookshelves in the physics room.

15% Test / Quizzes

Exams will be given in essay format, and a final exam will be given for your second and third trimester. A short quiz will be given out periodically to see where you stand with the material. These can be given in any form (e.g. essay, draw a diagram, multiple choice, applied math problems, etc). They do not need to be announced.

20% Other (Ot) Student Lead Discussions:

Every Monday there will be a student lead discussion in an area of technology and its implications. These discussions will focus either on the controversies or the advancements gained from a new technology. Students will be required to:

1. Find an appropriate topic to discuss.
2. Provide copies of the reading material for all of their classmates on the Friday before their Monday discussion.
3. Lead the discussion, by creating guided questions.
4. Create a 15 question multiple choice quiz to be given at the end of the class.
5. Grading the quiz and giving all materials to me (the instructor).

The order for the talks will be posted on the calendar for this class at www.drjdegan.com. Essentially it is in alphabetical order, and simply restarts after the class list is completed: Bunting, DeLawder, Glass, Hughes, Marshall, O'Reilly, Tyndall, Wright. If you are absent the day of your discussion, your discussion will occur the day of your return.

20% Projects

Unlike past scientific projects/labs this class focuses on the development of an issue from your imagination to an implementation. That being said, projects will usually last for several weeks before a final outcome is seen. The project will go through the following tiers in development.

- 1) Brainstorm an idea
- 2) Division into two teams (research group **A** and **B**)
- 3) The two research groups will then be in competition for investigation, constructing and providing their data for the tested project.

Writing: the Highest Form of Thinking:

Group projects will produce a lab report (guide online: www.drjdegan.com). Briefly, each section will be written with all group participants involved. Names from each person will be denoted at the end of the author's paragraph. Example below

First, 0.5g of Lead II Nitrate was measured out and added into a flash containing 50ml of H₂O. Then 0.29g of Potassium Chromate was measured and added into a separate flask containing 50ml of H₂O. Both flasks were swirled until the crystals were completely dissolved. The flask of Potassium Chromate was then poured into the Lead II Nitrate. A Whatman filter was folded and placed into a funnel in order to filter the compounds. The solution was gradually poured through the filter. The filter was left to dry and weighed. The data was recorded to determine the actual yield (Glass).

The **introduction** will provide dense background information, A clearly stated problem and hypothesis, and whether or not your data refutes or accepts your hypothesis. In the case of accuracy and precision we will be using a 5% cutoff. (example: the project is designing a pneumatic air cannon and based on the testing and the mathematics the distance projected at a 45° angle should be 100m so if the projectile lands within 95-105m the hypothesis is accepted.

A correctly written **materials and methods** section will include illustrations of the design with dated changes noted. This section will also include all mathematical formulas used in the testing process.

The **results** and **discussion** section will follow standard format. With the **figures** section requiring photographs of the final project and data tables.

10% Trimester Project

Even though this is an elective, you will be involved in the trimester project expo. Each student will be assigned several underclass students to evaluate and edit their posters. This will occur on the days noted on November 3rd and 4th. I will orchestrate it with your teachers for you to be present in my and Dr. McDowell's class during those days. This Trimester Poster Project has specific guidelines that they must follow. Since all of you (except one) has been through this tedious process three times, you are a very valuable teacher to your fellow classmates. Honesty is required for their success. However, meanness will not be tolerated.

You will be required to fill out a form for each student for me to produce a grade for you (worth 20% first trimester). How you treat and help the underclass students will have an impact on your trimester grade. The trimester project guidelines are located at www.drjdegan.com.

5% Participation

Student participation is essential for success in this class. You will receive a participation grade for each student lead discussion and also a weekly participation grade for research group activities. Constant reminders to put away cell phones, paying attention to discussion, having sideline discussions during a student lead discussion, playing music, or non pertinent use of the computer during class time are not only in violation of the general class rules but they will also have an impact on your participation grade.

Late work

Points will be deducted for late submissions unless evidence for extenuating circumstances is given prior to submission deadline.

- For daily assignments there is a 30% deduction for a late assignment in the first trimester, 50% the second trimester and 75% the third trimester.
- If a long term assignment is late (an assignment that has been posted on the calendar for over a week), there will be a 30% deduction and a parental notification.

Pedagogic Principles and Approaches

Experiential:

- Organization = 50% of success in science
- Labs will be pretty much all open ended
- Partner interaction, small group communication, evaluations

Mathematics:

- Formula explanations
- Word problems
- Significant figures – scientific notations

Writing:

- Study of scientific writing
- Content is more important than form
- All lab reports are to be composed using google.docs.
- Rough draft – rubric – self correct

Scientific Writing:

Use the following rough draft indicators to reread and fix your lab report section.

**FFFF- Format/mechanics problem check online guide for
correct format.**

**SSSS- Look closer at this statement and make it easier to read
and run a spell check.**

**WWWW- - Incorrect word choice, rephrase and remove
inappropriate word**

EEEE - See me

**JJJJ- Made too far of a jump from one statement to the next.
You need to add a sentence or two to clarify this
assumption or transition.**

MMMM- Add more information here

PROJECT-1A – GROUP EVALUATION (TEAM A)

Grading rubric:	Possible	Score	Reason
Introduction	20	-6	Tulson-Missing paragraph -4
			Smith-
			Keene-
			Davis-
			Ruddard- in this study lacking results -2
Materials Methods	20	-3	Tulson- not full explanation of the method -2
			Smith-
			Keene-
			Davis-
			Ruddard- units are wrong -1
Results	20	-6	Tulson- missing paragraph -4
			Smith-
			Keene-
			Davis- use past tense -2
			Ruddard-
Conclusion	20	-5	Tulson- only one sentence -3
			Smith-
			Keene-
			Davis-
			Ruddard- scrambled conclusion -2
Figures & Tables	20	-3	Tulson- no legend -2
			Smith-
			Keene-
			Davis-
			Ruddard- legend only one sentence -1
format	(- 10pts)	-5	Headings BOLD CENTER ALL CAPS
TOTAL	100	72	

PROJECT-1A – INDIVIDUAL EVALUATION (TULSON)

Grading rubric:	Possible	Score
Introduction	4	-4
Materials Methods	4	-2
Results	4	-4
Conclusion	4	-3
Figures & Tables	4	-2
format		
TOTAL	20	5

Tulson scored a $77/120 = 64\%$
 Ruddard scored a $86/120 = 72\%$

 Keene, Smith and Davis scored a $92/120 = 77\%$

PROJECT-1A – INDIVIDUAL EVALUATION (KEENE)

Grading rubric:	Possible	Score
Introduction	4	
Materials Methods	4	
Results	4	
Conclusion	4	
Figures & Tables	4	
format		
TOTAL	20	20

I have read the syllabus and understand the conditions by which I will be evaluated.

Print your name

Your signature

Print your parent or guardian's name

Your parent or guardian's signature

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Your parent or guardian's email address

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Your parent or guardian's preferred contact phone number

