Physics 122 – Class #13
Date: 9/30/14

Exam #1:

Lowest score 10%
Highest score 110%

72 people took the exam. The score distribution is the following:

[0-19]: 4
[20-39]: 21
[40-59]: 12
[60-79]: 17
[80-99]: 14
[100-110]: 4
Exam #1:

Few comments …

You have seen all the problems that were on the exam. #1 and #2 were homework problems. #3 was done in recitation, your TA solved it for you. The extra credit problem was a MP homework problem.

I posted on the website, and told you many times: If you know how to do the homework problems, and the recitation problems, you will do well on the exam.

On Tuesday in class I told you there will be a lens problem....

I expected better scores ...
Exam #1:

Any comments?
How to calculate the grade:

Grade = 0.1*(Q%) + 0.1*(A%) + 0.15*(OH%) + 0.15*(WH%) + 0.5*(E%)

Q% - percentage from quizzes
A% - percentage from attendance
OH% - percentage from MP Homework
WH% - percentage from Written Homework
E% - percentage from Exams
I suggest ..... 

Do your homework assignments with understanding and in a timely manner. Homework is 30% of the grade, but the exams are 50% of the grade...

Whenever you are having trouble with the material, ask for help. You can get help every day! The schedules for Help Sessions from OSL and for the Drop-in Sessions in WORKMAN 110 are posted on the class website: [http://www.physics.nmt.edu/~saska/phys122.html](http://www.physics.nmt.edu/~saska/phys122.html). Look at the bottom of the page under “Getting Help”, and you will find the links to the schedules.

My office hours are Tuesday and Thursday 3:30 till 5:00 pm. Or e-mail me, we can schedule another time.
Succeeding at College: How Not to Fail or Flounder

Katy Daniel
Contribution

In college, the once angering restrictions put on students are released, and one's true adulthood blossoms in the form of choices. At Tech, attendance is not regularly taken in most large classes, although some instructors use instruments such as pop quizzes to give class credit to those who show up. Missing the pop quiz or just not showing up can drastically increase the disintegration of one's grade. If passing classes and acing tests and homework is in one's abilities, then learning how not to fail a class is something one needs to learn. However, if perpetual slacking and procrastinating is one's way of life and one is constantly waver on the edge of passing and failing despite studious measures, then read on.

While many different professors will hand out specific syllabi and give guidelines about exactly what to do to pass their test, one may still find difficulty in getting a passing grade. The following key steps (more information on www.bookrags.com) will allow one to see how to take the skills already acquired and put them to use in the classroom. Everyone has the ability to pass a class. It is up to the individual person to apply their strengths to academics so that they can succeed.

Go to class and be on time. When ill or involved in exceptional circumstances and one must miss class, and then do so. At Tech, when one is sick the smartest thing to do is to go to the school nurse, located in Fidel, and get a note, and then email one's professor that attendance is not an option, include in the email that a note from the nurse was acquired. The next class one is able to attend, have the required homework that you missed done and turn in the note personally to the professor. This allows the professor to trust the student and the student to be more responsible. One or two absences in a semester generally will not harm one's grade.

When in class, listen and pay attention. Take notes. If one simply sits in class and daydreams or does other work, then one will not learn anything and the risk of failing during the test, because many professors provide clues as to what will help one study for the test or what will be in the test during class. Asking questions is a good idea. Try to ask one question every week or so. It makes it appear that one is following the class and wants to know more. Also, when one is really paying attention, one may "catch" a professor's mistake, which is always fun.

Participation is often involved in the overall grade in a class. Thus, if one never shows up or participates, the grade may sink even when one accurately solves the tests and homework. Even when class participation is not a part of one's final grade, one may still want to participate, because it allows the professor to know that one is interested in learning the material in class.

Study groups, especially at Tech, are sometimes essential for success. Form a study group to aid in the acquisition of new material. Two minds are always better than one. However, make sure the study group is a strong one that will lead to more learning rather than more socializing. Visit one's professor's office hours, or make a specific appointment with them if possible. This will allow one's professor to get to know one as more than a number, or face and name.

Conceptually, the professor may be more lenient with one's grade. Alternatively, the professor will know one has tried to work hard on learning. When one does go to the office hours, make sure that specific questions about relevant material is at hand, and one is trying to learn, otherwise going is a waste of one's time, and more importantly a waste of one's professor's time.

Write all essays or papers more than one day before they are due. If one is writing something too fast, than silly grammatical mistakes are easily overlooked, and those mistakes can lower one's grade for no other reason than simple carelessness.

Allowing more than one day before the due date will allow one to make sure the paper is complete and answers whatever question it is supposed to, look over it, proofread, and make last minute changes.

Study for exams/tests more than one day before they are given.

Cramming may be successful one or two times, but the unnecessary stress may cause one to not learn enough information to excel. Make sure that studying is possible more than one day in advance so that the final day can be used for review or just relaxing before the test.

Overall, an expression of interest in the class is key. Even if you detest the class, showing interest to the professor, doing one's work, and showing up are keys to success. It may seem daunting to follow the above guidelines to not fail, but if one puts in a little effort into all of them, then failing is not the result. One fails a class because one does not show up, one does not study, and one shows disinterest. Do the exact opposite, and failure is not an option.

Top 10 Classes to Fail at Tech

With such a large dropout rate at New Mexico Tech, many students fail classes quite often, so these are just a few classes to watch out for.

1. Calculus II
2. Physics II
3. CS 113
4. Physics II, the third time
5. Physical Chemistry (both of them)
6. Calculus II, the eighth time
7. Organic Chemistry
8. Microbiology
9. Circuits, for non-majors
10. Thermodynamics


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Announcement

The final exam will be optional:

- If you did well on the 3 exams, or are happy with your grade, you don't have to take the final.

- If you take the final exam, it will replace your lowest exam.
Announcements/reminders

MP HW05 and written HW05 are due Thursday, 9/02/14

MP HW06 and written HW06 are due Tuesday, 9/07/14

Next exam ...

Check the website regularly to make sure of assignments and due dates.
(http://www.physics.nmt.edu/~saska/phys122.html)
Physics 122 – Class #13

Last class: Coulomb's law

Today: Electric field of point charges, continuous charges ...
$$\vec{F}_{2\text{on1}} = \vec{F}_{1\text{on2}} = k \left| \frac{q_1 q_2}{r^2} \right|$$

$$k = \frac{1}{4\pi\varepsilon_0}$$

\(\varepsilon_0\) - permittivity constant.

$$\vec{F}_{\text{on} q_3} = \vec{F}_{1\text{on3}} + \vec{F}_{2\text{on3}}$$

Superposition of forces...
Electric field

Function that has a vector assigned everywhere

Source charge \( q \) → produces \( \vec{E} \)

\( q' \) - test (probe) charge

\[
\vec{E} = \frac{\vec{F}_{\text{on } q'}}{q'}
\]

units \( \left[ \frac{N}{C} \right] \)

\( |\vec{E}| \) - el. field strength

Convention: \( q' \) is positive :
source \( \Theta \)

\[
\mathbf{E} = \frac{\mathbf{F}_{\text{on } q}}{q}
\]

source “+” \( \Rightarrow \) \( \mathbf{E} \) directed away from \( q \)

“-” \( \Rightarrow \) - - - - - toward \( q \)
\[ \vec{E} \text{ from a point charge} \]

\[ \vec{E} = \frac{\vec{F}_{\text{on } q'}}{q'} = \frac{1}{4\pi \varepsilon_0} \frac{q}{r^2} \hat{r} \]

\[ \vec{F}_{\text{on } q'} = \frac{1}{4\pi \varepsilon_0} \frac{q q'}{r^2} \hat{r} \]

\[ \text{EL. field diagram} \]
Superposition:

\[ 9.1 \oplus \]

\[ 92 \oplus \]

\[ 93 \]

\[ \{9,1 = 92\} = 93 \]

\[ \hat{x} \hat{y} \hat{z} \]

\[ E_{\text{net}} = E_1 + E_2 + E_3 \]

\[ (x,y) \]

\[ (E_{\text{net}})_x = (E_1)_x + (E_2)_x + (E_3)_x \]
\[ \vec{E}_{\text{net}} = (E_{\text{net}})_x \hat{i} + (E_{\text{net}})_y \hat{j} \]

Read tactic boxes !!!
Example 26.1

\[ \overrightarrow{E_{\text{net}}} = ? \quad \text{in point } P \]

Assume \( g \)'s are (+)

\[ (E_{\text{net}})_y = 0 \]

\[ (E_{\text{net}})_x = (E_1)_x + (E_2)_x + (E_3)_x \]
\[(E_1)_x = (E_2)_x = \frac{1}{4\pi \varepsilon_0} \frac{2}{x^2 + d^2} \cos \Theta\]

\[(E_2)_x = \frac{1}{4\pi \varepsilon_0} \frac{2}{x^2}\]

\[\cos \Theta = \frac{x}{\sqrt{x^2 + d^2}}\]

**\(\vec{E}_{\text{net}} = E_{1x} + E_{2x} + E_{3x} = \frac{9}{4\pi \varepsilon_0} \left[ \frac{2x}{(x^2 + d^2)^{3/2}} + \frac{1}{x^2} \right] \)**

\[\vec{E}_{\text{net}} = (E_{\text{net}})_x \hat{i}\]

\[\frac{x \gg d}{\lim_{x \to \infty} \frac{2x}{x^8 \left(1 + \frac{d^2}{x^2}\right)^{3/2}} = \frac{2}{x^2}}\]
Check: for $x \gg d$ - expect $\vec{E}$ of a point charge w/ $q = 3q$

$$\vec{E}_{\text{not}} = \frac{9}{4\pi \varepsilon_0} \frac{3}{x^2} \hat{i} = \frac{(3q)}{4\pi \varepsilon_0 x^2} \hat{i} \quad \checkmark$$
$\vec{E}$ of continuous charges

**Linear charge**

$\lambda = \frac{Q}{L}$ - total charge

$L$ - length

**Surface charge**

$\eta = \frac{Q}{A}$ - surface area

$A$ - surface area

$Q$ - total charge
1) Divide the continuous charge $Q$ into point charges $dq$.

2) Calculate $d\tilde{E}$ due to each $dq$.

3) Sum up all the fields $\rightarrow$ integrate.
Example 26.3

Line charge - \( L \)

\[ Q \rightarrow \lambda = \frac{Q}{L} \]

\[ d\mathbf{E}_x = \frac{1}{4\pi\varepsilon_0} \frac{dQ}{(r^2 + y^2)^{3/2}} \cos \theta \]

\[ \cos \theta = \frac{r}{\sqrt{r^2 + y^2}} \]

\[ \Rightarrow d\mathbf{E}_x = \frac{1}{4\pi\varepsilon_0} \frac{\lambda dy}{(r^2 + y^2)^{3/2}} \]

\[ \mathbf{E}_\text{rod} = \int_{y_2}^{y_1} d\mathbf{E}_x \hat{i} \]
\[ E_{\text{rod}} = \frac{\lambda L}{4\pi \varepsilon_0 r} \left[ \frac{\frac{1}{2}}{\sqrt{r^2 + \frac{L^2}{4}}} - \frac{-\frac{1}{2}}{\sqrt{r^2 + \frac{L^2}{4}}} \right] \]

\[ \lambda L = 0 \]