

# PH125 Lecture 1

G.J. Mankey for P. LeClair

# OFFICIAL THINGS

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- Dr. Patrick LeClair
  - pleclair@ua.edu    please include 'ph125' in subject
  - offices: 228 Bevill, 110 Gallalee
  - lab: 180 Bevill
  - 857-891-4267 (cell)
- Office hours:
  - *TR 1-2pm in Gallalee*
  - *MW 12-2 in Bevill*
- *other times by appointment*

# OFFICIAL THINGS

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## Lecture/Lab:

- 203 Gallalee
- Tue-Thur 11-12:55

## Recitation:

- F 12-12:55

# OFFICIAL THINGS

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- Graduate Assistant:  
TBA ... but you will have one!
- Physics Help Desk  
“Pooled” intro GTA office hours  
Hours TBA (soon)

# MISC. FORMAT ISSUES

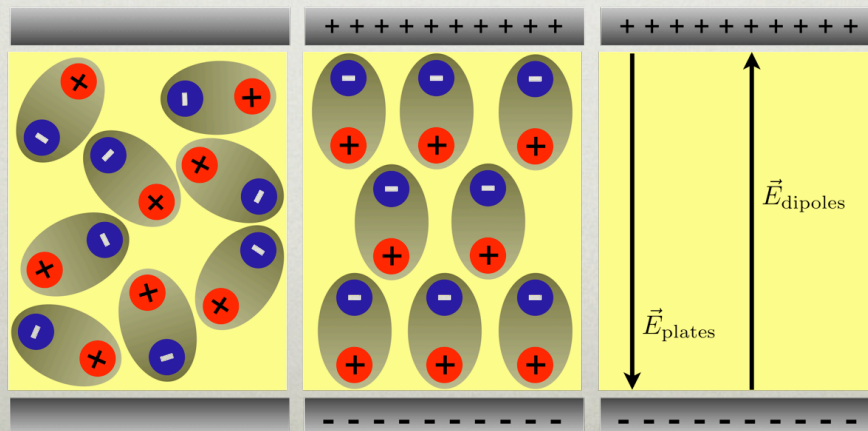
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- lecture and labs will try to stay linked
- learn a concept, then demonstrate it
- friday recitations: work problems + quiz
- working in groups is encouraged *for homework*

# SOCIAL INTERACTION

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- we need you in groups of 3-4 for labs
- groups are not assigned ...
  - ... so long as they remain functional relationships
  - even distribution of workload



# WHAT WILL WE COVER?

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- motion
- force & Newton's laws
- friction & drag forces
- kinetic & potential energy
- momentum
- rotation, angular momentum, torque
- gravitation
- fluids
- oscillations & waves
- thermal physics

# GRADING AND SO FORTH

- labs / exercises
- homework
  - given weekly
  - rolling due dates
- quizzes
  - short one each period
- exams
  - 3 'hour' exams
  - comprehensive final

| Component            | Sections                       | %       |       |
|----------------------|--------------------------------|---------|-------|
|                      |                                | section | total |
| <i>In-class work</i> | Labs & Exercises <sup>†</sup>  | 12.5    |       |
|                      | Quizzes <sup>†</sup>           | 12.5    |       |
|                      |                                |         | 25    |
| <i>Outside work</i>  | Homework problems <sup>‡</sup> | 20      |       |
|                      |                                |         | 20    |
| <i>Hour Exams</i>    | Exam I                         | 10      |       |
|                      | Exam II                        | 10      |       |
|                      | Exam III                       | 10      |       |
|                      |                                |         | 30    |
| <i>Final Exam</i>    |                                |         | 25    |

<sup>†</sup> The lowest two grades will be dropped.

<sup>‡</sup> The lowest single grade will be dropped.

# HOMWORK

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- new one every friday on course blog [pdf]
- problems due throughout week!  
e.g., 2 on Tues, 2 on Thurs, 3 on Fri
- hard copy or email (e.g., scanned) are OK  
Gallalee or Bevill mailbox  
give to TA at lab time
- can collaborate - BUT turn in your own
- have to show your work to get credit.

## Example: you have a homework set out now

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**two** problems are due TUES 13 Jan, start of class

they cover math prerequisites

**three more** are due THURS 15 Jan, start of class

they cover the lecture from Tues 13 Jan

**three more** are due FRI 16 Jan, *end of the day*

they cover the lecture from Thurs 15 Jan

late problems @ 50% credit ...

each day's problems tied to *previous* lecture

# HOMework

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- Do a little bit each day after class ...
- Each day's solutions given right after class
- You must follow the template  
(or a reasonable facsimile)
- The template helps emphasize technique  
the same template will be used for quizzes and exams

Name & ID

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I.

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Find / Given:

Sketch:

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Relevant equations:

Symbolic solution:

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Numeric solution:

Double Check

Dimensions

Order-of-magnitude

# QUIZZES

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- most days, there is a quiz
- almost the same as one of that day's problems
- previous lecture's material
- 5-10 min anticipated
  
- do the homework & reading, and it will be trivial

# LABS / EXERCISES

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- one major lab per week
- days without labs:
  - problem solving, research, applications
- we drop the lowest 2 ...
- time is always critical ...
  - read carefully, work efficiently

# STUFF YOU NEED

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- textbook

Halliday / Resnick / Walker.

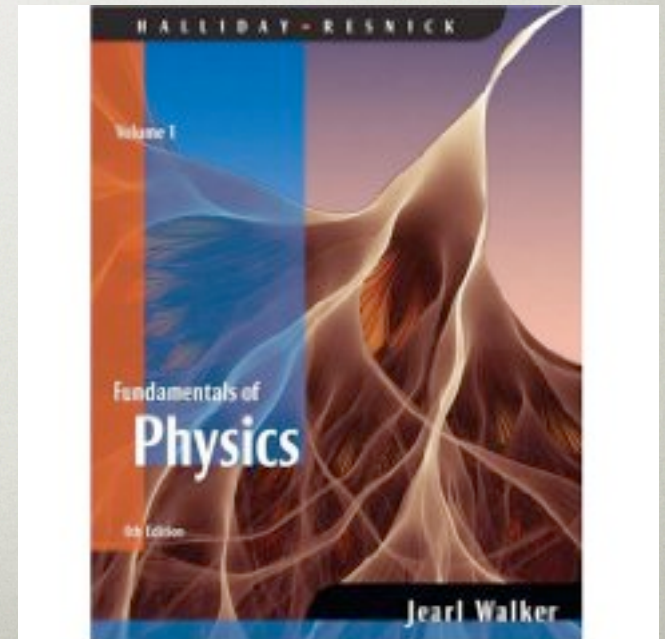
Fundamentals of Physics, 8<sup>th</sup> edition, Vol. 1

get a used one.

- calculator

basic with trig/log

- notebook



# SHOWING UP

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- no make-up of in-class work or homework
  - “acceptable” + documented gets you a BYE
- missing an exam is seriously bad.
  - acceptable reason ... makeup or weight final
- lowest 2 labs, quizzes are dropped.

# DISTRACTIONS

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- cell phones
  - set them to a quiet mode.
  - take the call outside if it is urgent
- “no food / drink”
- leave the web surfing for later

# OTHER

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## Academic misconduct

- do your own work on quizzes & exams
- suspected violations referred to A & S
- teamwork encouraged on labs/homework

## Accessibility / disability accommodations

- for a request - 348-4285 Disabilities services
- after initial arrangements, contact me

# INTERNETS

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- we have our own intertubes:
  - <http://physics125.blogspot.com/>
  - updated very often. often late.
  - comments allowed & encouraged
  - rss feed
- [google calendar](#) (you can subscribe)
- [Facebook group](#) ... (find each other)
  - can add RSS feed of blog to facebook
- check blog & calendar before class

# SCHEDULE

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- *There is no class this Friday !!!*
- For Tuesday:
  - two homework problems due (math review)
  - review Ch. 1 & 3 in the text
- Beyond ...

# THE MASTER PLAN

## PH125 Spring 2009

| Tuesday |                          |             | Thursday |                              |                         | Friday |                        |                                |
|---------|--------------------------|-------------|----------|------------------------------|-------------------------|--------|------------------------|--------------------------------|
| date    | topic                    | exercise    | date     | topic                        | exercise                | date   | topic                  | exercise                       |
| 13 Jan  | Units, math, notation    | estimation  | 8 Jan    | Syllabus, course overview    | assessment              | 9 Jan  | No class               | HW <sub>1</sub> out            |
| 20 Jan  | Motion in 2D             | problems    | 15 Jan   | Motion in 1D                 | 1D motion lab           | 16 Jan | Motion in 2D           | HW <sub>2</sub> out            |
| 27 Jan  | Newton's laws            | problems    | 22 Jan   | Projectiles, circular motion |                         | 23 Jan | Newton's laws          | HW <sub>3</sub> out            |
| 3 Feb   | <b>EXAM I</b>            |             | 29 Jan   | Friction, drag               | 2nd law lab             | 30 Jan | Motion on curved paths | HW <sub>4</sub> out            |
| 10 Feb  | Potential energy         | problems    | 5 Feb    | Kinetic energy & work        | work-kinetic lab        | 6 Feb  | Kinetic energy         | HW <sub>5</sub> out            |
| 17 Feb  | Momentum                 | problems    | 12 Feb   | Potential energy             | Coeff. of restitution   | 13 Feb | Consv. of energy       | HW <sub>6</sub> out            |
| 24 Feb  | Rotation                 | problems    | 19 Feb   | Momentum/collisions          | 1D collisions lab       | 20 Feb | Center of mass         | HW <sub>7</sub> out            |
| 3 Mar   | Angular momentum         | Exam review | 26 Feb   | Rotation                     | Rotational dynamics     | 27 Feb | Rolling motion         | HW <sub>8</sub> out            |
| 10 Mar  | Statics & equilibrium    | problems    | 5 Mar    | <b>EXAM II</b>               |                         | 6 Mar  | Exam post-mortem       | HW <sub>9</sub> out            |
|         |                          |             | 12 Mar   | Fluids                       | short paper topics      | 12 Mar | No class               |                                |
|         |                          |             |          | <b>SPRING BREAK</b>          |                         |        |                        |                                |
| 24 Mar  | Gravitation              | short paper | 26 Mar   | Gravitation                  | short paper             | 27 Mar | Harmonic motion        | HW <sub>11</sub> out/paper due |
| 31 Mar  | Oscillations             | problems    | 2 Apr    | Harmonic motion              | Harmonic motion lab     | 3 Apr  | Waves                  | HW <sub>12</sub> out           |
| 7 Apr   | Waves                    | problems    | 9 Apr    | Waves                        | Standing waves lab      | 10 Apr | Honors day, no class   | HW <sub>13</sub> out           |
| 14 Apr  | <b>EXAM III</b>          |             | 16 Apr   | Temperature & Heat           | Newton's law of cooling | 17 Apr | 1st law of thermo      | HW <sub>14</sub> out           |
| 21 Apr  | Kinetic theory of gasses | problems    | 23 Apr   | Entropy & 2nd law of thermo  | Boyle's law lab         | 24 Apr | Entropy, engines       |                                |
| 28 Apr  | What comes next          | dead week   | 30 Apr   | Exam review                  | dead week               | 1 May  | Exam review            |                                |

# A quick advertisement:

## Phy-EE double major

- Electrical and Computer Engineering majors need only 4 additional hours to complete a second major in Physics.
- This combination of fundamental and applied physics can be highly advantageous when the graduate enters the job market.

# A quick overview of Physics I

the nickel tour of mechanics.

# Basic Quantities

- Dimension =  $d$  [units]
- Length =  $x$  [meter]
- Time =  $t$  [second]
- Mass =  $m$  [kilogram]
  
- Systems International, SI aka MKS.

# Derived Quantities

- Velocity =  $v = dx/dt$  [meter/second]
- Acceleration =  $a = d^2x/dt^2$  [meter/second<sup>2</sup>]
- Momentum =  $p = d(mx)/dt$  [kilogram\*meter/second]
- Force =  $dp/dt$  [kilogram\*meter/second<sup>2</sup>]
- Work =  $\int \mathbf{F} \cdot d\mathbf{x}$  [kilogram\*meter<sup>2</sup>/second<sup>2</sup>]
- Instantaneous Power =  $\mathbf{F} \cdot \mathbf{v}$  [kilogram\*meter<sup>2</sup>/second<sup>3</sup>]

# Special Case: $a = \text{constant}$

- Kinematic Equations in 1-D:
  - $x = x_0 + v_0t + \frac{1}{2}at^2$
  - $v = dx/dt = v_0 + at$
  - $a = dv/dt = a$
  - $v^2 = v_0^2 + 2a(x - x_0)$
- 2-D Projectile Motion:  $\mathbf{a} = -g\mathbf{j}$ 
  - $R = v_i^2 \sin 2\theta_i / g$
  - $h = v_i^2 \sin^2 \theta_i / 2g$

# Conservation of Energy

- $\Sigma W = \Delta KE$
- $KE = \frac{1}{2} mv^2$
- $E = KE + PE$
- $PE = -GMm/r$ 
  - For  $r = R + h$  ( $h \ll R$ )
  - $PE = -GMm/R [1 - h/R] = PE_0 + mgh$

# Problem Solving (Page 42)

- Conceptualize
  - Think about and understand
  - Make a drawing
  - Known and unknowns
  - Estimate
- Categorize
  - Simplify
  - Substitution or analysis?
  - Classify
- Analyze
  - List relevant formulae
  - Apply mathematical principles to calculate the result
- Finalize
  - Check units
  - Examine extremes
  - Compare to other results
  - What have you learned?

# Where to Start

- Read the Textbook!
  - chapters 1 & 3 by Tuesday
- Come to Class. (except this Friday)
- Do the Homework.
  - You have a little bit due each day