GR Friday 10th September 2004

Note Title 09/09/2004

Outline for today

- Housekeeping information (prerequisites, class coordinates, ...)
- Instructor information
- Text resources
- Motivation of course material
- Requirements (e.g. homework, final exam)
- Assessment (% of components towards final grade, ...)
- Academic Integrity
- A respectful environment

and, last but not least,

answering your questions!

e.g. how will you know if this course is right for you?

e.g. what have you heard about this course?; dispelling myths about it – or me...

Housekeeping

Lectures will be held regularly
Wednesday and Friday 1–2 pm
here in MP 134 (not MP 118).

I will hold a weekly office hour
This is tentatively scheduled on
Wednesday 4:30 – 5:30 PM
It straddles an hour-boundary
to allow students taking a course
either 4–5 or 5–6 to attend.

* action: if this does not work for you,
raise the issue in the question period.

No tutorials, labs, (or field trips. ☺).

Prerequisites – there are no formal prerequisites.
But since this is
{ PHY 483F (a fourth-year undergraduate course)
{ PHY 1483F (a graduate course, first-year)
it is an advanced course. As such, it is
unlikely to be accessible to an average 3rd
year student. Exceptional students are
welcomed; it's best to discuss with the prof.
if you are in doubt.

I will assume that you understand well
- Lorentz transformations;
- E&M ($\vec{E}$ & $\vec{B}$ fields, Maxwell's equations);
- Lagrangians, Euler-Lagrange equations;
- Multivariable calculus;
- Partial differential equations;

and that you are willing to learn.

Instructor information

Name: Amanda W. Peet
↑(not the Hollywood actress)

Title: Prof. & Dr.
Call me "Prof. Peet"

Office: MP 1118 (11th floor, MP building, Burton Tower)

E-mail: I communicate much better in-person or over the phone. The course grader will handle the phy483f@physics.utoronto.ca account, referring cases to me verbally only when necessary. Total capacity for reading/responding for whole class is about ½ hour per week, max.

Phone: (416) 978-3911 . Has voicemail. Use it!

Web Hub: www.physics.utoronto.ca/~phy483f/

Contains THE most up-to-date info on the course. Check it at least twice a week. Pre-class reading and homework will be posted (only) here.

Policy on individual communication: Yes. ☺ Please use my office hour primarily, phone secondarily.

Your grader is a graduate student who is doing forefront research involving general relativity. (He won't be holding office hours because he gets paid only for grading - and helping me a bit with e-mail and the course website.)
See me for grading concerns.

--- and me? ↘

(Instructor information, cont'd ---)

Snipped from my website
www.physics.utoronto.ca/~peet/home/ :-

Brief CV

- *Alfred P. Sloan Research Fellowship*, 2002
- *Radcliffe Fellowship*, 2002
- *PREA*, 2001
- *CIAR Scholar*, Cosmology and Gravity Programme (2000-5)
- *Assistant Professor*, University of Toronto, Canada (2000-)
- *Postdoctoral Fellow*, Institute for Theoretical Physics (ITP), UCSB, US (1997-2000)
- *Postdoctoral Research Associate*, Princeton University, US (1994-1997)
- *Ph.D.*, Stanford University, US (1994)
- *B.Sc.(Hons)*, University of Canterbury, New Zealand (1990)

That's me professionally, in brief.

Some other aspects of me as a person:

Enthusiastic about education and fairness/equity

Casual dresser

Welcoming ♀ ♂ and straight.

I love mountains, hiking and skiing (downhill!).

I like short hair & see long faces with long hair!

Text resources

Sean Carroll's new 2003 textbook
"An Introduction to General Relativity: SPACETIME AND GEOMETRY".

Author and I overlapped as postdocs; I noted his skills as a teacher in person. Coverage goes somewhat beyond what I can cover here, but it's good to have options for further learning. Also, it will be a great reference if you go into astrophysics, cosmology, high-energy theoretical physics, etc. A keeper. Readable - clear, conversational tone.

* Bookstore has run out of stock, I believe. I will ask them how fast they can get more. If you tried to get a copy but couldn't, bring this up in the question period.

↑ Required text.

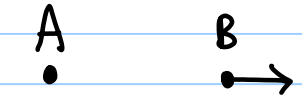
Other resources available (on reserve in Library).

(No other course costs, or equipment, or outside activities.)

(▷ Delay in getting enough textbook copies will not handicap you in marked work. First assignment is not due until October 13. Don't fret!)

Before each class, I expect you to read certain pages of the Carroll text, to make lectures easier for you to understand. This will really start to matter after the first week or so.

Motivation of course material



(A) Frames of reference. ↔ laws of physics

- Galilean relativity: $\left\{\begin{array}{l} t' = t \\ x' = x + vt \\ y' = y \\ z' = z \end{array}\right\}$ constant relative velocity $|v| \ll c$
- Special relativity: $\left\{\begin{array}{l} ct' = \gamma(ct + vx) \\ x' = \gamma(x + vt) \\ y' = y \\ z' = z \end{array}\right\}$ constant relative velocity $|v| \lesssim c$

$$\gamma \equiv \frac{1}{\sqrt{1 - v^2/c^2}}$$

- constant acceleration?
- what if neither relative velocity nor acceleration is constant, between our two observers?

▷ How do we formulate laws of physics which look the same in different coordinate systems?

▷ What if there is acceleration (etc)?
Is this the same as gravity?
c.f. how you feel in an elevator.

(B) Spacetime as geometry.

"Tensor calculus"

- One of Einstein's brilliant observations was to notice that Newton's theory of gravity is non-relativistic. There is a maximal mismatch between the speed of light (c) and the speed of Newtonian gravity (∞, for instantaneous action at a distance!)!

➡ think what would happen if sun vanished...

▷ Put together gravity and coordinate transformation symmetries.

⇒ General Relativity! Mathematically elegant.

Assessment

Two big components

① Substantive homework assignments (written)

HW1, HW2, HW3
due: W 13 oct, F 05 nov, W 01 dec

Each worth the same.
Individual work.
(not group work.)

See web page for lateness policy.

② Final exam (exams are during 09-20 Dec)

* Your choice: (a) open-book written exam: 3 hours
(b) closed-book oral exam: ½ hour
= individual session examined by the prof, one-on-one.
(class majority vote) decision

Grade algorithm:

G = final mark
H = (HW1 + HW2 + HW3)/3 } in %
E = exam

(b) $G = 0.6H + 0.4E$

(a) $G = 0.6 \max(H,E) + 0.4 \min(H,E)$

* I do curving. (See web page for motivation.)

▷ Estimation of workload:
Expect average should be about 2(-3?) x{class hours}
- reading assigned pages of text
- consolidating lecture notes w online notes & text
- homework!
- deep learning (rather than superficial)

Academic integrity

"Plagiarism and cheating will not be tolerated."

What does this mean?!

= © awp

(1) Coming to lectures. Downloading the lecture notes from the comfort of your dorm room is a form of stealing. The notes are provided for dyslexic students and others with disabilities making note taking difficult. They are also there so that you can listen to my explanations fully - take your own notes to add to my notes. This is a service I gift you. ☺

(2) Doing homework assignments by yourself. Copying off some "smart friend" cheats the other students in the class, and it cheats you and your friend. Identical-looking assignments will be referred to me by the grader. You may discuss general physics principles behind the questions with other students - and I encourage you to participate in study groups.

(3) Participating in class. Sitting there like a vege while other students think hard and bother to answer questions is parasitic, intellectually. Contribute.

(4) Providing proper evidence of claimed reasons for absences. E.g. medical certificate from student health centre if you get the flu a few days before HW#2 is due. Necessary only for grading instruments. I expect you can be trusted to come to class regularly so will not police you by taking roll call.

A respectful environment

We are all responsible adults. Please be maximally considerate to other students in the class (and me). We all want to optimise the learning experience.

- Please arrive on-time; and please don't leave early (unless you notified me before class, and sit near the door).

- Please do not talk or whisper in-class. If you have a concern about the class, please raise your hand and share it with me; I'll address it suitably. Chances are someone else may be thinking the same thing!

- Please observe posted signs banning food & drink in classrooms. (Custodians cover huge territory.)

- Please turn cell phones off or to vibrate-only. I will try to set an example by remembering to turn off my Blackberry's sounds. ☺

- I appreciate your consideration and observation of these guidelines for decorum in-class. In turn, I will treat you with consideration and respect.

- Please do not bring personal conversations inside, beyond the start of lecture. Thanks!

My aim is to foster an environment of mutual respect – between all of us, students and teacher included.

Class composition

Grad students : ~12
Undergrads : ~25

} excellent! ☺

Astro : ~7
Physics : ~15 !
CITA : ∅
Math : ~4
Engineer : ~12
Other : Medical biophys

This is going to be an interesting, great class!