Course:	PHY 380.04
Instructor	Dr. Christensen
Email:	neil.christensen.qft@ilstu.edu
Phone:	(309)438-5502
Office:	MLT 312D
Office Hours:	TR 12:15-12:30 MWF 2:00-2:30 or by appointment
Tentative Recitation:	TR 10:45-11:00 in MLT 215 if available
Lecture:	TR 11:00-12:15 in MLT 215
Required Materials:	Textbook: **Gravity: An Introduction to Einstein's General Relativity**, by James Hartle
Exams:	1 oral and 1 written final

Tentative Topics

There are two tracks that I am considering for this course. Depending on student interest, we can either focus on black holes or gravitational waves. In either case, we will begin by covering:

Ch. 1: Gravitational Physics
Ch. 2: Geometry as Physics
Ch. 3: Space, Time and Gravity in Newtonian Physics
Ch. 4: Principles of Special Relativity
Ch. 5: Special Relativistic Mechanics
Ch. 6: Gravity as Geometry
Ch. 7: The Description of Curved Spacetime
Ch. 8: Geodesics

Once these are finished, we could either focus on black holes or gravitational waves. If time allows, I also hope to develop Einstein's equations. Here are two possible scenarios I envision.

Black Hole Track	Gravitational Wave Track
Ch. 9: The Geometry Outside a Spherical Star	Ch. 16: Gravitational Waves
Ch. 12: Gravitational Collapse and Black Holes	Ch. 20: A Little More Math
Ch. 13: Astrophysical Black Holes	Ch. 21: Curvature and the Einstein Equations
Ch. 20: A Little More Math	Ch. 22: The Source of Curvature
Ch. 21: Curvature and the Einstein Equations	Ch. 23: Gravitational Wave Emission

Grading

Your course grade will be based on exams and homework in the following proportions:

40% Exams
60% Homework

Your letter grade will be determined according to the following percentages of the total possible scores:

90% A
80% B
70% C
60% D

This means that if you get full credit on all the homework (something that is attainable and I expect everyone to achieve), and at least 25% on the exams, you will get a C. If you get full credit on the homework and at least 50% on the exams, you will get a B. If you get full credit on the homework and at least 75% on the exams, you will get an A.

Homework

There will be a homework assignment due every class meeting. Typically 2-3 problems from Hartle's textbook each time. This is a good amount of work, so plan accordingly, but it is in line with what is done at other universities. You are also expected to read the textbook section **before** coming to class. (I suggest you read it before coming to class and then again after class before starting your homework.) In order to reach the highest level of General Relativity Nirvana at the end of this class, it is essential that you "meditate" on these truths (by thoughtfully reading the text and thoroughly doing the homework every time.)

All homework is expected to be turned in on time. You will get much more benefit and be more prepared for the next lecture and the exams if you turn homework in on time. However, at times, a late homework can not be avoided. In these cases, you can turn your homework in late for half credit.

When you do not get full (or half if late) credit on an assignment due to incorrect or unclear solutions, you can redo the part that was incorrect or unclear and turn it back in to get full (or half if late) credit. This means, that there is no reason you should not get full (or half if late) credit on every homework assignment. Sometimes this takes several attempts. That is ok. Please keep doing it until you get it. The point is to **learn** from your mistakes! :)

You can turn late homework into on-time homework by attending colloquium, physics club, astronomy club, a weekly solar-car meeting, attending lunch with the colloquium speaker or another class event. In order to take advantage of this, write the date you attended the event on your late homework when you turn it in. Such a homework will be graded as if it is on time. Every homework is essential, so no homework will be dropped. But, as discussed here, it is possible to get full credit on all the homework under any circumstance, so please do.

At this point in your career, you should be becoming proficient in writing solutions to homework problems. This is an important part of your development as a physicist. For this reason, I will require that your solutions are **legible**, **correct** and **followable**. This means, among other things, that no two equations should appear together without an explanation of what is happening between them. Vector symbols should be consistent. And, all equations should be complete logical statements that connect with the previous idea or have words explaining them. If you break these rules, you will get a zero on the assignment until you fix the problems. (Please don't forget to fix the problem and turn it in again. You can still get full credit on the assignment.)

Recitation

I will arrive in class 15 minutes early (at 10:45) to answer questions about the current homework or the previous lecture. Recitation is optional but if no students attend, we will discontinue recitation.

Exams

There will be two parts to the final. The first part will be oral and the second part will be written. Each will contribute half of the final exam grade.

The oral part will be scheduled with the instructor and will be private. The instructor will give the students 3 homework problems to choose from. The student can use his/her homework solution for that problem and the textbook. The student's score will be given according to the following:

- A + 5% - Does not use HW or help from instructor. But may use textbook to look up starting formulas.
- A - Uses HW and/or limited use of the textbook but does not need help from the instructor.
- B - Needs a small amount of help from the instructor but shows good understanding.
- C - Needs a medium amount of help from instructor but shows some understanding.
- D - Can not do problem without significant help from instructor and does not show much understanding.

For this reason, it is imperative that you write your HW solution in a way that you can fully understand at a later time. **The instructor will ask questions to make sure the student understands every aspect of the oral final.**

Academic Integrity

Although it is ok to discuss certain aspects of this course with other students, the final work on all assignments and exams must be your own. Homework can be done in groups according to class policies but the final homework must be the work of the student claiming credit for it. Additionally, exams must be done by the student alone and with no help from anyone other than the instructor. Any violations will be dealt with according to university policy.

Disability

Any student needing to arrange a reasonable accommodation for a documented disability should contact Disability Concerns at 350 Fell Hall, (309)438-5853, on the web at DisabilityConcerns.IllinoisState.edu.

Counseling

Life at college can get very complicated. Students sometimes feel overwhelmed, lost, experience anxiety or depression, suffer with relationship difficulties or diminished self-esteem. However, many of these issues can be effectively addressed with a little help. Student Counseling Services (SCS) helps students cope with difficult emotions and life stressors. Student Counseling Services is staffed by experienced, professional psychologists and counselors, who are attuned to the needs of college students. The services are FREE and completely confidential. Find out more at Counseling.IllinoisState.edu or by calling (309) 438-3655.