FYOS1001 – EINSTEIN AND THE THEORIES OF RELATIVITY
Prof. Loris Magnani - Fall 2014

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Class Hours: Monday 2:30 PM – 3:20 PM in Dawson Hall 379
Office Hours: Monday 3:30 – 5:00 AM (or by appointment)
Call Number from Schedule of Classes: 81412

Textbooks:
Relativity and Its Roots (RIR) – Banesh Hoffmann
Einstein His Life and Universe (ELU) – Walter Isaacson

INTRODUCTION

Einstein’s theories of Relativity revolutionized physics at the start of the 20th century. Along with Quantum Mechanics, these theories laid the foundations for modern physics in the 20th century and are critical for technological applications up to the present day (note, for instance, that GPS systems would not work accurately in the absence of General Relativity). Einstein developed the Special Theory of Relativity by 1905 and the General Theory of Relativity by 1915. He spent the remaining 4 decades of his life searching for the Unified Field Theory, a theory of how everything in physics would work. In this course, we will have an introductory look at all three theories, focusing on the first two which are an accepted part of the physics curriculum – the Unified Field Theory as conceived by Einstein is not accepted by contemporary physicists. We will not stress mathematics though we may use an algebraic equation or two once in a while. I don’t expect you to have any background in these theories; we will learn a bit about them by reading the two required texts (see above) and discussing them in class.

CLASS FORMAT

Every week we will get together and discuss that week’s reading (see reading schedule below). I expect you to have read the material BEFORE coming to that week’s class. If you show up unprepared, then this class will not work for you, nor will it be interesting. There may also be extra reading from the Web that I will assign from time to time.
GRADING POLICY

At the end of the semester, your overall grade will be determined from your performance on 2 short (6-10 typewritten pages, double-spaced) essays and on class participation. Each essay is worth 1/3 of your total grade and class participation will also count as 1/3 of your total grade. The topic of the first essay will be some aspect of Special Relativity, and the second will be on General Relativity. There will be perhaps a dozen topics to choose from for each essay and the choices for topics will be handed out in class a month before each essay is due. You will be able to turn in a first draft of the essay, which I will read and make comments on, and then, two weeks later, you will turn in the revised essay. The first draft of the first essay is due on September 15th, and the first draft of the second on November 10th. The first drafts will not be graded (though I will make comments involving both grammar and content!), but the revised essays will be graded on the familiar A-F grading system with plus/minus, if necessary. If the revised essay is not turned in on time, I will deduct a letter grade for every week that the essay is late.

Letter grades for the revised essays will then be assigned numerical equivalents following this scale:

- A+ corresponds to 100.0
- A corresponds to 96.0
- A- corresponds to 92.0
- B+ corresponds to 88.0
- B corresponds to 84.0
- B- corresponds to 81.0
- C+ corresponds to 78.0
- C corresponds to 75.0
- C- corresponds to 72.0
- D corresponds to 65.0
- F corresponds to 50.0

Class participation will be judged subjectively by me according to the following scale:

- Excellent participation corresponds to 100.0
- Good participation corresponds to 90.0
- Average participation corresponds to 80.0
- Below average participation corresponds to 70.0
- Little or no participation corresponds to 50.0

Your total grade will then be averaged from the 3 numerical grades and the final, numerical, grade will be converted to a final letter grade using the following scale:
A corresponds to 93.00 – 100.0
A- corresponds to 90.00 – 92.99
B+ corresponds to 87.00 – 89.99
B corresponds to 83.00 – 86.99
B- corresponds to 80.00 – 82.99
C+ corresponds to 77.00 – 79.99
C corresponds to 73.00 – 76.99
C- corresponds to 70.00 – 72.99
D corresponds to 60.00 – 69.99
F corresponds to less than 60.00

FIRST-YEAR ODYSSEY SEMINAR EVENTS

As part of the First-Year Odyssey Seminar program we want students to be aware of all the resources available on campus and to become engaged in the cultural and intellectual life of the University; therefore, students enrolled in First-Year Odyssey seminars will be required to attend at least three campus events during the semester that highlight some aspect of the mission of the University. There are many events to choose from, including musical performances, films, visiting speakers, and the Study Abroad Fair. In addition, students may participate in five hours of service to the community through VolunteerUGA as one event. A list of events can be found at https://fyo.uga.edu/BrowseEvents.aspx

STUDENT RESPONSIBILITIES

Please make a reasonable attempt to arrive on time. If you must leave earlier than the scheduled end of class, try to do so with as little fuss as possible. Class disruptions or distracting behavior will not be tolerated.

You are responsible for all topics discussed in class, as well as class announcements. Although attendance is not mandatory, it is in your best interest to attend every class and absence from class does not excuse you from the just-stated responsibility. Since a portion of your grade is based on class participation, you cannot participate if you are not present.

You are encouraged strongly to read the material that is to be covered in class ahead of time. If the schedule of readings changes from that posted below, then those changes will be announced in class.

Ask for clarification on anything you find unclear, ambiguous, or unspecified. This includes both course policies and physics topics.

Know the rules concerning withdrawals and incompletes, published in the UGA Undergraduate Bulletin. Note that I will NOT withdraw you from the course for
excessive absences. Note also that after the midpoint of the semester, a withdrawal is assigned a grade of WF, except in those cases in which the student is doing satisfactory work and the withdrawal is recommended by the Office of Student Affairs because of emergency or health reasons.

Tentative Class Schedule & Readings & Homework Assignments:

August 18 – Introduction
August 25 – ELU – Ch. 1-4 – Einstein’s Early Years
September 1 – no class; Labor Day
September 8 – RIR Ch. 1-4 – Newtonian Relativity; The Ether
September 15 – RIR Ch. 5; ELU Ch. 5 – Special Relativity (SR); Essay 1 first draft due
September 22 – ELU Ch. 6; RIR – Ch. 5 – Final thoughts on SR
September 29 – ELU Ch. 7-9 – The Development of General Relativity (GR)
October 6 – RIR Ch. 6; ELU Ch.9 – More on GR; Revised Essay 1 due
October 13 – ELU Ch. 10-12 – The New Copernicus
October 20 – ELU Ch. 13-14 – The Astrophysical Implications of GR
October 27 – ELU Ch. 15-16 – Unification
November 3 – ELU Ch. 17-18 – Einstein’s God
November 10 – ELU Ch. 19-20 – Quantum Entanglement; Essay 2 first draft due
November 17 – ELU Ch. 21-22 – War and Peace
November 24 – no class; Happy Thanksgiving!
December 1 – ELU Ch. 23-25 – Einstein’s Last Years; Revised Essay 2 due
December 8 – Final Thoughts