

(Modern Physics II)

Relativity, Particle Physics and Cosmology

PHY 306.001 --- Spring 2017 Syllabus
Physics Department --- Mercer University

Main Texts: Modern Physics, 3rd edition, by Kenneth Krane; and
An Introduction to Modern Cosmology, 3rd edition, by Andrew Liddle
Secondary Text: The New World of Mr. Tompkins, by George Gamow and Russell Stannard
Class Meetings: MWF 3-3:50pm, SEB 140
Instructor: Dr. Jose L. Balduz Jr
email: balduz_jl@mercer.edu, **phone:** 478- 301-2229, **office:** SEB 205,
office hours (tentative): T 10am-2pm, R 4-6pm, or by appointment (try email)...
Course web page: <http://physics.mercer.edu/balduz/ModPhys/defaultS17.htm>
Please also see Physics Department home page at <http://physics.mercer.edu>.

This course is the companion to **PHY 305 (Modern Physics I) Early Quantum Theory and Its Applications**. Together they introduce the student to the main developments of twentieth-century physics. This course will explore **special relativity, the atomic nucleus, elementary particles, and cosmology**. It is intended primarily for physics majors, but should be of interest also to many other students, especially those majoring in chemistry, computer science, engineering and mathematics.

Prerequisites are (a) a year of calculus **MAT 191/192 Calculus I/II**, and (b) a year of calculus-based physics **PHY 161/162 General Physics I/II**.

The primary goal of this course is for students to develop conceptual understanding of these topics rather than detailed knowledge, which they may gain in more advanced courses. The secondary goal is for students to learn some of the mathematics of relativity, and to combine this with basic quantum physics to describe elementary interactions and the shape and history of the universe.

By mastering the material in the main text, students will learn to perform relativistic calculations. They will also be able to understand and explain the basic experimental results that led to replacement of classical ideas of space and time by relativity; the nature of the atomic nucleus and its constituents, including nuclear decays, reactions, fission and fusion, and some of their applications; the fundamental particles and their interactions, using the quark model; the conceptual and observational basis for general relativity, and its application to stellar evolution including black holes; and the big bang cosmology, including the evidence for expansion and dark matter.

Writing essays based on the supplementary text will enhance the students' conceptual understanding and their ability to explain and discuss nuclear and particle physics, special relativity, general relativity and cosmology.

Lectures: During most class meetings there will be some conventional lectures. We will also discuss the material and go over questions and problems in the text, as well as homework and test problems.

Office hours: Please come see me! If you're doing well in the course, we can talk about physics concepts and the big picture; or about your life after Mercer; or other things... If you're not doing so well in this class, I can try to help you one-on-one, before you get too far behind. Typically that means talking about the material with you, but also having you work problems with me right in my office. There's no substitute for working through a problem yourself, with someone by your side that knows the way...

Homework: The instructor will assign sets of homework problems related to the material in the main texts, to be worked by the students and handed in for grading. Students are encouraged to collaborate on these; however, each must hand in their own separate paper. After the papers are collected, a solution sheet will be provided. Altogether, the homework will count for 40% of the total grade.

Take-home Tests: There will be two of these, containing primarily numerical problems and derivations, but also some conceptual questions. The only resources allowed each student for these are the texts, class notes and the instructor. Altogether, the take-home tests will count for 20% of the total grade.

Essays: Certain days (4) will be primarily devoted to discussion of the material from the secondary text. On the morning of the essay day (first thing), the students will "hand in" a short essay (electronic submission by email) on the reading material. These will be presented to the class by them, and in part will form the basis for discussion. All the essays together will count for 20% of the total grade. The minimum length will be 500 words for the first three essays and 1000 words for the final essay.

Final Exam: This will take place on **Friday, May 5** at 7-10pm. It will be mostly qualitative and open-book, will cover all the material from the main texts, and will count for 20% of the total grade.

Grading: The percentage for each activity is shown in the left table below. To convert the total percent to a letter grade, use the scale shown in the right table below.

	#	total %
Homework sets	10	40
Tests	2	20
Essays	4	20
Final Exam	1	20
		Total: 100

	GP	%
A	4.0	90-100
B+	3.5	85-89
B	3.0	80-84
C+	2.5	75-79
C	2.0	70-74
D	1.0	60-69
F	0.0	0-59

Miscellaneous policies:

If changes to this syllabus are necessary, they will be implemented after discussion and negotiation with the students. Note that the accompanying course schedule is not a part of the syllabus: it is tentative and subject to revision, including all due dates.

Assignment due dates: Homework assignments and take-home exams are always due in class on the due date: However, they will not be considered late as long as they are turned in before the next sunrise (or first thing in the morning). Essays are always actually due on the morning of essay reading day (first thing). Beyond that, any late assignments will suffer a 5% penalty per day (excluding weekends and holidays) until they are handed in: i.e., 5% on the first day, 10% on the second day...; up to a maximum penalty of 50% after 10 days.

There will be no dropped grades or extra-credit work. All work done in the course will be counted.

Honor Code: The College of Liberal Arts' academic misconduct policy will be followed. All students are bound by the Mercer University Honor Code...

Disability support: Students requiring accommodations for a disability should inform the instructor at the close of the first class meeting or as soon as possible. The instructor will refer you to the Disability Support Services Coordinator to document your disability, determine eligibility for accommodations under the ADA/Section 504 and to request a Faculty Accommodation Form. Disability accommodations or status will not be indicated on academic transcripts. In order to receive accommodations in a class, students with sensory, learning, psychological, physical or medical disabilities must provide their instructor with a Faculty Accommodation Form to sign. Students must return the signed form to the Disability Services Coordinator. A new form must be requested each semester. Students with a history of a disability, perceived as having a disability, or with a current disability, who do not wish to use academic accommodations are also strongly encouraged to register with the Disability Services Coordinator and request a Faculty Accommodation Form each semester.

For further information, please contact Carole Burrowbridge, Disability Services Coordinator, at 301-2778 or visit the Disability Support Services website at <http://www.mercer.edu/studentaffairs/disabilityservices>

All requests for reasonable accommodation are welcome also in regard to absence from class for school representation (i.e., athletic or other events) or personal/family problems.