

COURSE OUTLINE FOR PHYS 551 (THEORETICAL PHYSICS I)

INSTRUCTOR:	Emanuele Berti
OFFICE:	205 Lewis Hall
CLASS SCHEDULE:	Tue/Thu 1:00pm-2:15pm, Lewis Room 109
OFFICE HOURS:	Thu 2:30pm-3:30pm, or by appointment
EMAIL:	berti [at] phy.olemiss.edu
COURSE WEBSITE:	http://www.phy.olemiss.edu/~berti/phys551.html
PHONE:	662-915-1941
PREREQUISITE:	PHYS 308 OR GRADUATE STATUS
COURSE CREDIT HOURS:	3

TEXTBOOKS:

- (1) *Mathematics of Classical and Quantum Physics*, by Frederick W. Byron and Robert W. Fuller
- (2) *Mathematical Methods for Physicists* by George B. Arfken and Hans J. Weber

OTHER USEFUL BOOKS:

- (3) *Mathematics for Physicists*, by Philippe Dennery and Andre Krzywicki
- (4) *Methods of Theoretical Physics*, by Philip McCord Morse and Herman Feshbach
- (5) *Methods of Mathematical Physics*, by Richard Courant and David Hilbert
- (6) *Advanced Mathematical Methods for Scientists and Engineers: Asymptotic Methods and Perturbation Theory*, by Carl M. Bender and Steven A. Orszag
- (7) *Numerical Recipes: The Art of Scientific Computing*, by William H. Press, Saul A. Teukolsky, William T. Vetterling and Brian P. Flannery
- (8) *Mathematical Methods in the Physical Sciences*, Third Edition, by Mary L. Boas

The main text for the course is *Mathematics of Classical and Quantum Physics* by Frederick W. Byron and Robert W. Fuller. We will also use *Mathematical Methods for Physicists* by George B. Arfken and Hans J. Weber. In class I will point to selected chapters from the other books for a more advanced treatment of certain topics and complementary material.

COURSE GOALS AND LEARNING OUTCOME:

The course will cover some mathematical techniques commonly used in theoretical physics. This is not a course in pure mathematics, but rather on the application of mathematics to problems of interest in the physical sciences.

PRELIMINARY OUTLINE OF THE COURSE:

Depending on your initial preparation, to be assessed by a preliminary test that will *not* count for your final grade, we will cover some or all of the following topics:

- Vector calculus in curvilinear coordinates;
- The theory of analytic functions;
- Linear algebra, vectors and tensors in physics;
- Special functions and their physical applications;
- Partial and ordinary differential equations; analytical and numerical methods for their solution.

This is a course in mathematical *physics*, so the emphasis will always be on physical applications.

EVALUATION:

GRADE TYPE: Whole Letter Grade (A–F)

GRADE RANGES:

- A: 88% and up
- B: 75-87%
- C: 60-74%
- D: 40-59%
- F: less than 40%

GRADE PERCENTAGE: 60% Homework
10% Mid-term test
30% Final exam

HOMEWORK, IN-CLASS TESTS AND FINAL EXAM:

Homework assignments will be announced in class, and **they must be turned in at the beginning of class on the due date. Late homework will not be accepted.** In exceptional cases students may be excused from turning in an assignment. Homework must be easy to read: please write down clearly your name and the problem set number, do not use a red pen, write consistently on either one side or both sides of the paper and staple the pages together.

The final exam is open-book and will consist of problems to be worked out. Students will be allowed to use a calculator, and may be provided with an equation sheet by the instructor if necessary.

ATTENDANCE:

There is no strict attendance requirement. However I will not follow the textbooks too closely and I will try to cover some more “advanced” material, so you are strongly advised to attend class. If you miss an exam or cannot turn in homework on time because of illness, I will require a doctor’s note. If you will be away for other reasons, please inform me prior to your absence and get a note if applicable.

ACADEMIC INTEGRITY:

Violations of the University’s policy of academic integrity will result in a failing grade and other disciplinary actions. In particular, use of the Instructor’s Solution Manual is considered cheating. Students who use it will be subject to formal academic discipline charges.

NOTE:

If a change in the syllabus becomes necessary during the semester, it will be discussed in class and then posted on the course website. The course website will also contain up-to-date information on the class schedule, homework assignments and complementary material.