Course Outline for PHYS 552 (Theoretical Physics II)

Instructor:	**Emanuele Berti**
Office:	205 Lewis Hall
Class Schedule:	Tue & Thu 11:00am-12:15pm, Lewis Room 104
Office Hours:	By appointment
Email:	berti@phy.olemiss.edu
Course Website:	`http://www.phy.olemiss.edu/~berti/teaching.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

(3) *Advanced Mathematical Methods for Scientists and Engineers: Asymptotic Methods and Perturbation Theory*, by Carl M. Bender and Steven A. Orszag

Other Useful Books:

(4) *Methods of Theoretical Physics*, by Philip McCord Morse and Herman Feshbach

(5) *Methods of Mathematical Physics*, by Richard Courant and David Hilbert

(6) *Mathematics for Physicists*, by Philippe Dennery and Andre Krzywicki

(7) *Numerical Recipes: The Art of Scientific Computing*, by William H. Press, Saul A. Teukolsky, William T. Vetterling and Brian P. Flannery

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 (mainly as a reference) and *Advanced Mathematical Methods for Scientists and Engineers* by Carl M. Bender and Steven A. Orszag. 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:

We will cover the following topics:

- Hilbert spaces: complete orthonormal sets of functions
- Special functions (Legendre polynomials, Fourier series and integrals, spherical harmonics...)
- Sturm-Liouville systems: orthogonal polynomials
- Green's functions
- Elements of asymptotic analysis and perturbation theory

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, but you are strongly advised to attend class. If you miss an exam or cannot turn in homework, please inform me beforehand and get a doctor's 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.