

# PHYS 501

## Mathematical Physics I

*Fall 2018*

**Instructor:** Prof. S. McMillan (12-610/815, x2723/2709)  
**Time and place:** TuTh 9:30-10:50 pm, Disque 919  
**e-mail:** `steve (at) physics.drexel.edu`  
**URL:** <http://www.physics.drexel.edu/students/courses/physics-501>

### Course Outline

The goal of this course is the application of classical analytical methods to problems drawn from physics and elsewhere. Emphasis will be placed on application of the methods studied to partial and ordinary differential equations and to Fourier and other special function expansions. Limited computational examples will be included, although this course will not be specifically aimed at computational techniques. Topics covered will include:

1. Classification of partial differential equations
2. Methods of solution—separation of variables
3. Second-order linear ordinary differential equations—first and second solutions
4. Eigenfunction expansions
5. Fourier series
6. Bessel and Legendre functions—Bessel and Legendre series
7. Review of complex analysis—the residue theorem
8. Integral transforms
9. Green's functions and applications
10. Discrete and Fast Fourier transforms

Topics may change or be rearranged at short notice, depending on circumstances.

### Texts

*Essential Mathematical Methods for the Physical Sciences* (K. F. Riley & M. P. Hobson, Cambridge University Press, 2011). The recommended programming language for the course is Python. C++ will probably do, but it lacks the graphical and some other libraries that will be needed for the computational problems.

### Evaluation

The final grade for the course will be based on (1) a mid-term examination (25% of the total), tentatively scheduled for Thursday, November 1 (week 6), (2) a final examination (35%), to be held during finals week, and (3) 6–7 homework assignments completed during the quarter (40%). Assignments will be due one week after they are distributed. Late homeworks will receive reduced credit, at a rate of -10% per class period late. Homeworks turned in after they are discussed in class (about 1 week after they are due) or after the final examination will receive zero credit.