

# PHYS 516: MATHEMATICAL PHYSICS II

Vladimir Gudkov  
Office: PSC 401  
ph: 576-5573; email: [gudkov@sc.edu](mailto:gudkov@sc.edu)

## 1. Course Objectives:

The purpose of the course is to introduce students to methods of mathematical physics and to develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics.

Upon completion of the course, the student should be able to understand basic theory of:

- Fourier/Laplace Transforms
- Partial Differential Equations
- Green's Functions
- Special Functions
- Integral Equations
- Calculus of Variations
- Group Theory

Successful students should be able to:

- Solve standard problems with partial differential equations
- Expand a function in terms of orthogonal set of functions
- Work with Bessel functions
- Work with orthogonal polynomials
- Solve integral equations
- Solve variation equations

**2. Required textbook:** "Mathematical Methods for Physicists" by Arfken and Weber.

**3. Instructional delivery strategy:** The course will be taught using lectures followed up by homework assignments and periodic tests. Discussions of course topics during lectures are encouraged.

## 4. Course Requirements and Grading scheme:

Your overall score will be an average of all grades you have accumulated during the course, weighted as follows:

- Quizzes: 12%
- Homework/Project: 12%

- Each Examination: 21%
- Final Examination: 34%
- Project assignment (required for graduate students only)

Exams will be based on the material discussed in class, the material in homework assignments, the material in quizzes, and textbook.

Grading scale: A:88-100 B:76-87 C:63-75 D:50-62.

**5. Topical outline of content to be covered:**

- Fourier and Laplace Transforms (1 week)
- PDE (2 weeks)
- Green's Function (1 week)
- Sturm-Liouville problem (1 week)
- Bessel Functions (1 week)
- Legendre Polynomials and Spherical Functions (1 week)
- Hermite and Laguerre Polynomials (1 week)
- Hypergeometric Functions (0.5 week)
- Integral Equations (2 weeks)
- Calculus of Variations (2 weeks)
- Introduction to Group Theory (1.5 weeks)

**6. Attendance policy:**

Students are expected to attend each scheduled class meeting, to be on time, and to be prepared for each class session. The University attendance policy specifies that students may miss up to 3 class meetings (10% of class time) without penalty. The 4th absence will result in a grade penalty of one letter grade. The 5th absence will result in a deduction of 2 letter grades. Quizzes and homework cannot be made up except in the case of extreme illness or loss.

**7.** Any student with a documented disability should contact the Office of Student Disability Services at 803-777-6142 to make arrangements for appropriate accommodations.