MA692: Modeling and Computation in Optics and Electromagnetics

Instructor: Peijun Li, office: Math 440, phone: 49-40846, e-mail: lipeijun@math.purdue.edu

Time: TTh 9:00-10:15 am

Room: REC 302

Office hour: TTh 10:30-11:30 am

Course website

www.math.purdue.edu/∼lipeijun/math692.html

Prerequisite: Basic knowledge of functional and numerical analysis, and partial differential equations.

Description: This course addresses some recent developments on the mathematical modeling and the numerical computation of problems in optics and electromagnetics. The fundamental importance of the fields is clear, since they are related to technology with significant industrial and military applications. The recent explosion of applications from optical and electromagnetic scattering technology has driven the need for modeling the relevant physical phenomena and developments of fast, efficient numerical algorithms. As the applied mathematics community has begun to address a few of these challenging problems, there has been a rapid development of the theory, analysis, and computational techniques in these areas. The course will provide introductory material to the areas in optics and electromagnetics that offer rich and challenging mathematical problems. It is also intended to convey some up-to-date results to students in applied and computational mathematics, and engineering disciplines as well.

Particular emphasis of this course is on the formulation of the mathematical models and the design and analysis of computational approaches. Topics are organized to present model problems, physical principles, mathematical and computational approaches, and engineering applications corresponding to each of these problems.

Text: No textbook is required. Lecture notes will be made available to students.

Course grade: No exams. Students are required to present course-related material in class.

References

1. G. Bao, L. Cowsar, and W. Master, *Mathematical Modeling in Optical Science*
2. D. Colton and R. Kress, *Inverse Acoustic and Electromagnetic Scattering Theory*
3. J. Jin, *The Finite Element Method in Electromagnetics*
4. P. Monk, *Finite Element Methods for Maxwell's Equations*
5. J.-C. Nédélec, *Acoustic and Electromagnetic Equations: Integral Representations for Harmonic Problems*