Math 406, Section 101, Fall 2016

Variational and Approximate Methods in Applied Mathematics

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Text: No text. Written notes will be provided. Some suggestions of optional texts will be provided on the web page.

Material:

1. Interpolation, numerical integration and differentiation.
2. Ordinary differential equation boundary value problems:
   - Finite difference methods
   - Greens function representation
   - Variational methods and weak formulations
   - Finite element methods.
3. Time stepping techniques for initial value problems.
4. Parabolic and hyperbolic equations (one space dimension).
5. 2D Laplace equation:
   - Greens function representation
   - Finite element methods
   - Boundary element methods
6. Time permitting: multipole expansions; optimal travel paths using level set methods; regular asymptotic analysis

Computational implementation is an important aspect of the course.

Marks: 40% final, 10% midterm and 50% assignments

Midterm Date: Friday, October 21 in class.

Assignments: There will be five challenging assignments. Some computation will be required. MATLAB is a high level mathematical computation package that is suitable for these computations, but other packages or basic computer languages can be used.