

Partial Differential Equations and Complex Variables, EE 2020

Time: T5T6R5R6 (1:20PM-3:10PM, Tuesday and Thursday), at Room 209, Delta Hall

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(Dated: Fall, 2018)

• Text Books and References:

[Note]: Class handouts;

[Textbook]: E. Kreyszig, "Advanced Engineering Mathematics", 9th Ed., John Wiley & Sons, Inc., (2006).

[Ref.]: Stanley J. Farlow, "Partial Differential Equations for Scientists and Engineers", Dover Publications, (1993); (for PDE, but optional).

[Ref.num]: Matthew P. Coleman, "An Introduction to Partial Differential Equations with MATLAB", Chapman & Hall/Crc Applied Mathematics & Nonlinear Science (2004); (optional).

• Syllabus:

1. **Introduction to PDE and Complex variables**, (9/11, 9/13).

2. Diffusion-type problems: [Textbook] Ch.12, [Ref.] Ch.2.

- Derivation of the Heat equation
- Boundary conditions for Diffusion-type problems
- Separation of variables
- Solving nonhomogeneous PDEs
- Integral transforms
- The Fourier transform
- The Laplace Transform

3. Hyperbolic-type problems: [Textbook] Ch.12, [Ref.] Ch.3.

- 1-D Wave equation
- D'Alembert solution of the Wave equation
- Sturm-Liouville problems
- 2-D Wave equation in Cartesian and polar coordinates
- Laplace's equation in Cartesian, polar, and spherical coordinates

4. **1st-Exam**, (10/23).

5. Introduction to Numerical PDE: [Ref.num].

6. Complex variables: [Textbook] Ch.13-Ch.18.

- Complex numbers and functions
- Cauchy-Riemann equations
- Complex integration
- Complex power & Taylor series
- Laurent series & residue
- Conformal mapping
- Applications: real integrals by residual integration, potential theory

7. **2nd-Exam**, (1/8).

• Evaluation:

1. Four Homeworks, 40%;

2. 1st-Exam 30%; on 10/23, covering Ch.12 of the textbook.

3. 2nd-Exam 30%; on 1/8, covering Ch.13 - Ch.18 of the textbook

• Office hours:

3:10-5:00PM, Thursday at Room 911, Delta Hall.

• More information: iLMS

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