3 June 2008

Planned changes for the second edition of
"Heat Conduction using Green's Functions"
Cole, Beck, Haji-Shiekh, and Litkouhi.

OVERALL CHANGES

- Correct known errors
- Update references
- Cite web site "Green's Function Library"
- Review homework problems
- Improve index

DETAILED CHANGES

Chapter 0. Heat Conduction Basics (Chapter re-numbered from chapter I)

- Add discussion of physics behind non-Fourier conduction.
- Include W-transformation, taken from old problem 3.28

Chapter 1. Introduction to Green's Functions

- 1.1 Advantages of the GF method
- 1.2 **(new section)** Dirac delta function
- 1.3 **(new section)** Steady Heat Conduction in one dimension
- 1.4 **(new section)** Transient GF in the infinite body
- 1.5 – 1.7 same as previous sections 1.2 -- 1.5, re-numbered.

Chapter 2. Numbering System in Heat Conduction (no changes)

Chapter 3. Derivation of the Green's Function Solution Equation

- 3.6. Add pseudo GF for steady problems with Neumann boundaries
- 3.7 Cite recent work of Beck, Yen, McMasters, on special eigenvalues.

Chapter 4. Methods for Obtaining Green's Functions

- Throughout chapter, include language on cotime (long and short)
- 4.1, 4.2 (no changes)
- 4.3 Laplace Transform
  - Drop listing of properties of Laplace transform and cite new Appendix L
  - Consider dropping example 4.1 on case X10
  - Example 4.2 on case X30, show how it reduces to case X20 when h = 0.
  - Review all examples.
- 4.4 Separation of Variables
  - Shorten discussion of case X11 and drop example 4.3 on case X22.
  - Change caption of Table 4.2 to include description "long-cotime form"
  - Change Table 4.3 to either (a) case by case listing, or (b) drop table altogether
- 4.5 Product solution (no changes)
- 4.6 Steady Solution

4.6.1 Shorten discussion of “plane source” solution
4.6.2 Method of embedding (no changes)
4.6.3 Method of Images (drop entire section)
4.6.3 **(new section) Eigen function expansion**
4.6.4 Limit method (no changes)

New problem: show how X30 reduces to X10 when h goes to infinity

Chapter 5. (**new title**) Improvement of Convergence and Intrinsic Verification

Drop: Acceleration of series; numerical integration; Fortran codes

5.1 Consolidate old section 5.1 and 5.2

5.2 (**new section**) Identifying Convergence Problems
- 5.2.1 Test for Convergence
- 5.2.2 Monitor the Number of Terms
- 5.2.3 Convergence of Heat Flux

5.3 **(new section)** Strategies for improving convergence
- 5.3.1 Replacement of Steady-State Series
- 5.3.2 Alternate GF Solution Equation
- 5.3.3 Time partitioning

5.4 **(new section)** Intrinsic Verification.
- 5.4.1 Time-partitioning Intrinsic Verification
- 5.4.2 Intrinsic Verification for Steady State
- 5.4.3 Intrinsic Verification by Complementary Transients

Chapter 6. Rectangular Coordinates

Review entire chapter for references to Table 5.1-5.8 which will be dropped.

6.1 – 6.4 – include new descriptors “small cotime”, “large cotime”

6.3 Semi-infinite One Dimensional Bodies
- Drop Tables 6.1, 6.2, 6.3.
- Either drop Table 6.4 or move to Appendix E

6.4 Flat Plates: Small-cotime Green’s Functions
- Remove language on FIN(i,z) (from old Table 5.3, to be dropped)

6.5 Flat Plates: Large-cotime Green’s Functions
- Change example 6.5 to discuss replacement of steady-state part
- Drop Table 6.5

6.6 Flat Plates: Time Partitioning
- Shorten to one example on volume generation for 1D
- Emphasize time partitioning is best for 2D and 3D

6.7 Two-dimensional Rectangular Bodies.
- Add example on improving convergence of steady solution;
- and, time-partitioning

6.8 Two-dimensional Semi-infinite Bodies.

6.9 Steady State
- Include discussion of GF found from variation of parameters for 2D body
- Include alternate GF for steady rectangle example.

Chapter 7 Cylindrical Coordinates

(Old chapters 7 and 8 combined).
Update references, add two steady examples.

Chapter 8 Radial Heat Flow in Spherical Coordinates
(Old chapter 9 renumbered)

Chapter 9. (new chapter) Steady-Periodic Heat Conduction

- 9.1 Steady-periodic relations
- 9.2 One-dimensional Green's Functions
  - 9.2.1 One-dimensional GF in Cartesian Coordinates
  - 9.2.2 One-dimensional GF in Cylindrical Coordinates
  - 9.2.3 One-dimensional GF in Spherical Coordinates
- 9.3 Examples: One-dimensional Temperature
- 9.4 Layered Bodies
- 9.5 2D and 3D Cartesian Bodies
  - 9.5.1 Rectangles and Slabs
  - 9.5.2 Infinite and Semi-infinite Bodies
  - 9.5.3 Rectangular Parallelepiped
- 9.6 2D Cases in Cylindrical Coordinates
  - 9.6.1 Cylinders
  - 9.6.2 Slab with Axisymmetry
  - 9.6.3 Axisymmetric Halfspace

Chapter 10 – 12 (no changes)

Appendices (add a list of all appendices at the beginning of this section of the book)

- B. Bessel Functions
- **D. (NEW) Dirac Delta Function**
- E. Error Function (remove listings of Fortran code)
- F. Functions and Series (renamed from old appendix SE)
- I. Integrals (renamed from old appendix F)
- **L. (NEW) Laplace Transform**
- **P. (NEW) Properties (brief table, thermal properties of solids)**
- R. Green's Functions for Cylindrical Coordinates, Radial
- R-Phi. Green's Functions for Cylindrical Coordinates, (r,)
- Phi. Green's Functions for Cylindrical Coordinates Thin Shell
- RS. Green's Functions Spherical Coordinates, Radial
- X. Green's Functions for Rectangular Coordinates
  - Drop approximations to Eigenvalues
  - Completely fill out Tables X.1 and X.2 steady 1D cases
- N. Index of Solutions by Numbering System

Subject Index (review and improve)

Author Index (add new references)