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 Parallelepipeds
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, φ)
Phi. Green’s Functions for Cylindrical Coordinates Thin Shell
RS. Green’s Functions Spherical Coordinates, Radial
X. Green’s Functions for Rectangular Coordinates
   o Drop approximations to Eigenvalues
   o 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)