Heat Transfer on TK
(Based on Fundamentals of Heat and Mass Transfer by Incropera and DeWitt)

Here is a listing of the topics covered by the collection of TK Solver math models.

- CONDUCTION
  - 1D STEADY-STATE
    - THERMAL RESISTANCE
      - Plane Wall
      - Cylindrical Wall
      - Spherical Shell
      - Convection Process
      - Radiation Exchange
    - COMPOSITE WALL
      - Plane Wall - 4 Sections
      - Cylindrical Wall - 4 Sections
      - Spherical Shell - 4 Sections
      - Series-Parallel Wall A
      - Series-Parallel Wall B
    - INTERNAL ENERGY GENERATION
      - Asymmetric Plane Wall
      - Solid Cylinder
      - Solid Sphere
      - Asymmetric Composite Wall
    - FINS
      - Straight Fin, Triangular Cross Section
      - Straight Fin, Parabolic Cross Section
      - Annular Fin, Rectangular Profile
      - Circular Pin Fin; Convective Tip
      - Circular Pin Fin; Adiabatic Tip
      - Circular Pin Fin; Fixed Tip Temperature
      - Uniform Rectangular Fin; Convective Tip
      - Uniform Rectangular Fin; Adiabatic Tip
      - Uniform Rectangular Fin; Fixed Tip Temperature
  - 2D STEADY-STATE
    - SHAPE FACTORS
      - Sphere in Semiinfinite Medium
      - Horizontal Cylinder in Semiinfinite Medium
      - Vertical Cylinder in Semiinfinite Medium
      - Disk on a Semiinfinite Medium
      - Two Cylinders in Infinite Medium
      - Horizontal Circular Cylinder Between Planes
      - Circular Cylinder in a Square Solid
      - Eccentric Circular Cylinder in a Cylinder
      - Conduction Through Wall Edges
      - Conduction Through Wall Corners
    - RECTANGULAR CROSS-SECTION
      - Internal Generation and Convection
      - Matrix Solver
  - 1D TRANSIENT
    - LUMPED CAPACITANCE
      - Convection Only
      - General Analysis
    - UNIFORM INITIAL TEMPERATURE
      - Plane Wall
      - Cylinder

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                  Sphere
            NON-UNIFORM INITIAL TEMPERATURE
                  Plane Wall

            SEMIINFINITE MEDIA
                  Sudden Surface Temperature Change
                  Sudden Surface Heat Flux Applied
                  Sudden Surface Convection Process Applied
      2D TRANSIENT
                  Internal Generation and Convection - Rectangular Cross-Section

CONVECTION
      EXTERNAL FLOW
            FLAT PLATES
                  Laminar Flow - Uniform Surface Temperature
                  Laminar Flow - Uniform Heat Flux
                  Laminar Flow - Unheated Starting Length
                  Turbulent Flow - Uniform Surface Temperature
                  Turbulent Flow - Uniform Heat Flux
                  Turbulent Flow - Unheated Starting Length
                  Mixed Flow - Uniform Surface Temperature
            CYLINDERS
                  Hilpert Correlation
                  Zhukauskas Correlation
                  Churchill-Bernstein Correlation
                  NON-CIRCULAR, IN CROSS-FLOW
                        Square - Horizontal Diagonal to Flow
                        Square - Side Normal to Flow
                        Hexagon - Side Normal to Flow
                        Hexagon - Side Parallel to Flow
                        Plate - Normal to Flow
            SPHERES
                  Whitaker Correlation
                  Falling Drop - Modified Ranz-Marshall Correlation
            TUBE BANKS
          Zhukauskas Correlation - Aligned Tubes
          Zhukauskas Correlation - Staggered Tubes
          INTERNAL FLOW
FULLY DEVELOPED FLOW
          CIRCULAR  TUBES
          Laminar Flow - Constant qs"
          Laminar Flow - Constant Ts
          Turbulent Flow - Dittus-Boelter Correlation
          Turbulent Flow - Seider-Tate Correlation
          Turbulent Flow - Liquid Metals - Constant qs"
          Turbulent Flow - Liquid Metals - Constant Ts
          Laminar or Turbulent Flow, Constant q``
          Laminar or Turbulent Flow; Constant Ts
Pressure Gradient and Friction Factor
          NONCIRCULAR TUBES
          Rectangular - Constant qs"
          Rectangular - Constant Ts
          Triangular - Constant qs"
          Triangular - Constant Ts
          ANNULUS IN LAMINAR FLOW
          Outer Tube Tso - Inner Adiabatic
          Inner Tube Tsi - Outer Adiabatic
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Uniform Heat Flux on Both Surfaces
ANNULUS IN TURBULENT FLOW
Outer Tube Tso - Inner Adiabatic
Inner Tube Tsi - Outer Adiabatic
Uniform Heat Flux on Both Surfaces
ENTRANCE REGION
Combined Entry Length, Constant Ts, Sieder-Tate Correlation
FREE CONVECTION
PLATES
Vertical Plate
Hot Surface Up
Hot Surface Down
Inclined Plate
CYLINDERS
Long Horizontal Cylinder - Morgan Correlation
Long Horizontal Cylinder - Churchill Correlation
SPHERES
Sphere - Churchill Correlation
ENCLOSURES
Rectangular - Horizontal, Heated from Below
Long Horizontal Cylinders
Spheres
DIMENSIONLESS GROUPS
Biot Number (Bi)
Biot Number for Mass Transfer (Bi_m)
Bond Number (Bo)
Coefficient of Friction (Cf)
Colburn j Factor (jH)
Colburn j Factor for Mass Transfer (jm)
Eckert Number (Ec)
Fourier Number (Fo)
Fourier Number for Mass Transfer (Fo_m)
Friction Factor (f)
Grashof Number (Gr_L)
Jakob Number (Ja)
Lewis Number (Le)
Nusselt Number (Nu_L)
Peclet Number (Pe_L)
Prandtl Number (Pr)
Reynolds Number (Re_L)
Schmidt Number (Sc)
Sherwood Number (Sh_L)
Stanton Number (St)
Stanton Number for Mass Transfer (St_m)
Weber Number (We)

RADIATION
DIFFUSE GRAY SURFACES
VIEW FACTORS
2D GEOMETRIES
Parallel Plates - Midlines Connected by Perpendicular
Parallel Plates - Inclined of Equal Width and Common Edge
Perpendicular Plates - Common Edge
Three Sided Enclosure
Parallel Cylinders of Different Radii
Cylinder and Parallel Rectangle
Infinite Plane and Row of Cylinders

- Film Condensation - Spheres or Horizontal Tubes
- Film Condensation - Horizontal Tubes, Vertical Tier
- Inside Horizontal Tubes

HEAT EXCHANGERS
- OVERALL HEAT TRANSFER COEFFICIENTS
- Convection - Wall Resistance
- Tubular Type - Finned
- Tubular Type - Unfinned
- LOG MEAN TEMPERATURE DIFFERENCES
- Parallel or Counterflow Types
- TUBES
- CONCENTRIC
- Parallel Flow
- Counterflow
- SHELL-TUBE & CROSS FLOW TYPES
- Shell-Tube - One Shell Pass
- Shell-Tube - n Shell Passes
- Cross Flow - Both Fluids Unmixed
- Cross Flow - Cmin Unmixed and Cmax Mixed
- Cross Flow - Cmin Mixed and Cmax Unmixed
- All Exchangers - Boiling or Condensation

MASS TRANSFER
- CONVECTION, FLAT PLATE
- Parallel Turbulent Flow
- Parallel Flow, Mixed Conditions
- DIFFUSION
- 1D STATIONARY MEDIA
- SPECIFIED SURFACE CONCENTRATIONS
- Plane Media
- Cylindrical Media
- Spherical Media
- SPECIFIED SOLUBILITY AT SURFACES
- Plane Media
- Cylindrical Media
- Spherical Media
- SPECIAL APPLICATIONS
- Catalytic Surface Reactions
- Equimolar Counter Diffusion
- Evaporation in a Column
- Gas A through Liquid B with Reactions

PROPERTIES
- Solids
- Fluids

UNITS