Errata to the First Printing

1. EXAMPLE 3.5-1 has two part (b)'s
2. The heading "MATLAB's Ordinary Differential Equation Solvers" under section 3.8.2 should be italicized.
3. Equation (E6-85) in Section 2.7.2 - the matrix H_b should have a double line below it.
4. (Seth Avery, UW, ME564 1-27-09) On pg. 369, line 4 "...Min/Max Table option from the Solve menu." should be "...Min/Max Table option from the Calculate menu."
5. (Seth Avery, UW, ME564 2-6-09) On pg. 105, Eq. (1-228) should be:
$$\eta_{fin} = \frac{\dot{q}_{fin}}{\overline{h}\, A_{s,fin}\left(T_b - T_\infty\right)}$$
and on pg. 106, Eq. (1-229) should be:
$$\eta_{fin} = \frac{\left(T_b - T_\infty\right)\sqrt{\overline{h}\; per\, k\, A_c}\,\tanh\left(m\,L\right)}{\overline{h}\; per\, L\left(T_b - T_\infty\right)}$$
6. (Seth Avery, UW, ME564 2-11-09) On pg. 230, in the equation immediately after Eq. (15) the argument of the sine function should be $\lambda_i\, x$.
7. (Lucas Murphy, UW, ME564, 2-16-09) On pg. 232, the thickness is specified two times in the EES code. The line in the inputs section after L=.. and before k=... should be removed.
8. (Eelco Gehring, UW, ME564, 2-16-09) On pg. 220, the last sentence of the third paragraph from the bottom of the page should read: "Figure 2-7 illustrates the solution with 5, 10, and 100 terms."
9. (Jon Dolack, UW, ME564, 2-16-09) On pg. 305, Eq. (3-14) should read:
$$R = \left(\overline{h}\, A_s + \sigma\, \varepsilon_s\, 4\,\overline{T}^3\, A_s\right)^{-1}$$
10. (Seth Avery, UW, ME564, 3-2-09) On pg. 467, Eq. (3-594) should read:
$$\dot{g}_{bp} = 2\,\pi\, r_1^2\, \Delta r\, \beta\left(T_1 - T_b\right)$$
11. (3-10-09) On pg. 619, the caption for Figure 4-38 should read:
Figure 4-38: Drag coefficient as a function of the Reynolds number for flow past a sphere.
12. (3-13-09) On pg. 334, 3rd paragraph, 3rd sentence should read "The Integral Table is saved when the EES file is saved and the table is restored when the EES file is loaded." The words with and by should be deleted.
13. (Will Glewen, UW, ME 564, 3-25-09) On pg. 601, in Eq. (4-592), the power on the Reynolds number in the first integral should be -1/2 rather than 1/2. That is, Eq. (4.592) should be:
$$\overline{Nu}_L = \frac{0.3387\, Pr^{1/3}}{\left[1 + \left(\frac{0.0468}{Pr}\right)^{2/3}\right]^{1/4}} \int_0^{Re_{crit}} Re_x^{-1/2}\, dRe_x + 0.0296\, Pr^{1/3} \int_{Re_{crit}}^{Re_L} Re_x^{-0.2}\; dRe_x$$
14. (Glen Myers, UW, 4-2-09) On pg. 208, the reference to Myers in paragraph 1 should be: G.E. Myers (1998).
15. (Glen Myers, UW, 4-2-09) On pg. 301, the reference to Myers should be:

   Myers, G.E., *Analytical Methods in Conduction Heat Transfer, 2nd Edition*, AMCHT Publications, Madison, WI, (1998).

16. (Eelco Gehring, UW, 4-7-09) pg. 551, Eq. (4-340), the last term should be:

$$= \frac{1}{t_{int}} \int_0^{t_{int}} \left[-\frac{1}{\rho}\frac{dp_\infty}{dx} + \upsilon \frac{\partial^2 \overline{u}}{\partial y^2} + \upsilon \frac{\partial^2 (u')}{\partial y^2} \right] dt$$

17. (Eelco Gehring, UW, 4-7-09) pg. 576, Second paragraph from bottom, second to last sentence, the parenthetical statement should read:
(e.g., $v_{y=0}$ and $\tau_{y=\delta_m}$ are usually zero).
18. (Eelco Gehring, UW, 4-7-09) pg. 671, Section 5.3.1, second sentence should read:
Therefore, in order to solve...
19. (Nick Guldan, UW, 4-15-09), pg. 675,, last sentence of section 5.3.4 should read:
"The mean temperature of the fluid leaving the duct ..."
20. Section 5.3.5 on pg. 675 is mislabeled as Section 5.3.4.
21. (Seth Avery, UW, 4-13-09), pg. 980, Section 10.1.2, the speed of light should be c = 299,792 km/s.
22. (Prof. Kerry Patterson, Lipscomb University, 4-22-09), pg. 997, the entry in Table 10-1 for cylinder to cylinder should be:

$$F_{1,2} = \frac{1}{\pi}\left\{ \sqrt{\left(1+\frac{s}{2r}\right)^2 - 1} + \sin^{-1}\left[\left(1+\frac{s}{2r}\right)^{-1}\right] - \left(1+\frac{s}{2r}\right) \right\}$$

23. (Jake Leachman, UW, 5/7/09), First page of text after cover. Third paragraph should start:
"Sanford Klein is the Bascom Ouweneel Professor of Mechanical Engineering..."
24. On pg. 98, the sentence prior to Eq. (11-187) should read:
"Because Eq. (1-179) is a linear, homogeneous ODE, ..."
25. The first sentence in the caption under Figure 7-2 should read:
"Photographs of pool boiling at (a) low temperature difference, (b) moderate temperature difference, and (c) high temperature difference."
26. On pgs. 360 and 361, Eqs. (3-110) through (3-112) should have ordinary rather than partial derivatives. These equations should be:

$$\dot{q}_{x=0} = -k\,A_c \frac{d}{d\eta}\left[T_s + \left(T_{ini} - T_s\right)\mathrm{erf}\left(\eta\right)\right]\Big|_{\eta=0} \frac{1}{2\sqrt{\alpha\,t}} \qquad (3\text{-}110)$$

$$\dot{q}_{x=0} = -\frac{k\,A_c}{2\sqrt{\alpha\,t}}\left(T_{ini} - T_s\right)\frac{d}{d\eta}\left[\mathrm{erf}\left(\eta\right)\right]\Big|_{\eta=0} \qquad (3\text{-}111)$$

$$\dot{q}_{x=0} = -\frac{k\,A_c}{2\sqrt{\alpha\,t}}\left(T_{ini} - T_s\right)\frac{d}{d\eta}\left[\frac{2}{\sqrt{\pi}}\int_0^{\eta} \exp\left(-\eta^2\right)d\eta\right]_{\eta=0} \qquad (3\text{-}1)$$

27. In Eq. (4-302), the equality should be an approximation:

$$h_{lam} \approx \frac{k}{\delta_{t,lam}} \tag{4-302}$$

28. The equalities in Eqs. (4-308), (4-309), (4-310), (4-311), (4-312), (4-313), (4-316), and (4-318) should be approximations:

$$\delta_{t,lam} \approx 2\sqrt{\alpha t} = 2\sqrt{\frac{k x}{\rho c u_\infty}} \tag{4-308}$$

$$\delta_{m,lam} \approx 2\sqrt{\upsilon t} = 2\sqrt{\frac{\mu x}{\rho u_\infty}} \tag{4-309}$$

$$\frac{\delta_{m,lam}}{\delta_{t,lam}} \approx \frac{2\sqrt{\upsilon t}}{2\sqrt{\alpha t}} = \sqrt{\frac{\upsilon}{\alpha}} = \sqrt{Pr} \tag{4-310}$$

$$\delta_{t,turb} \approx 2\sqrt{\frac{k_{turb}\, x}{\rho c u_\infty}} \tag{4-311}$$

$$\delta_{m,turb} \approx 2\sqrt{\frac{\mu_{turb}\, x}{\rho u_\infty}} \tag{4-312}$$

$$\frac{\delta_{m,turb}}{\delta_{t,turb}} \approx 2\sqrt{\frac{\mu_{turb}\, x}{\rho u_\infty}}\,\frac{1}{2}\sqrt{\frac{\rho c u_\infty}{k_{turb}\, x}} = \sqrt{\frac{\mu_{turb}}{\underbrace{\rho}_{1/\upsilon_{turb}}}\,\frac{\rho c}{\underbrace{k_{turb}}_{\alpha_{turb}}}} \tag{4-313}$$

$$\frac{\delta_{m,turb}}{\delta_{t,turb}} \approx \sqrt{\frac{\upsilon_{turb}}{\underbrace{\alpha_{turb}}_{Pr_{turb}}}} \tag{4-316}$$

$$\frac{\delta_{m,turb}}{\delta_{t,turb}} \approx \sqrt{Pr_{turb}} \tag{4-318}$$

29. Equation (4-313) should be (the notes under the last square root are changed):

$$\frac{\delta_{m,turb}}{\delta_{t,turb}} = 2\sqrt{\frac{\mu_{turb}\, x}{\rho u_\infty}}\,\frac{1}{2}\sqrt{\frac{\rho c u_\infty}{k_{turb}\, x}} = \sqrt{\frac{\mu_{turb}}{\underbrace{\rho}_{\upsilon_{turb}}}\,\frac{\rho c}{\underbrace{k_{turb}}_{1/\alpha_{turb}}}} \tag{4-313}$$

30. Equations (4-358) and (4-361) should be modified slightly:

$$\frac{\partial \overline{T}}{\partial t} + \overline{u}\frac{\partial \overline{T}}{\partial x} + \overline{v}\frac{\partial \overline{T}}{\partial y} = -\frac{1}{\rho c}\frac{\partial}{\partial y}\left[\overbrace{\underbrace{-k\frac{\partial \overline{T}}{\partial y}}_{\substack{\text{diffusive} \\ \text{heat flux}}} + \underbrace{\frac{\rho c}{t_{int}}\int_0^{t_{int}} v' T' \, dt}_{\substack{\text{heat flux due to} \\ \text{turbulent mixing}}}}^{\text{total heat flux}}\right] \tag{4-358}$$

$$\frac{\partial \overline{T}}{\partial t} + \overline{u}\frac{\partial \overline{T}}{\partial x} + \overline{v}\frac{\partial \overline{T}}{\partial y} = -\frac{1}{\rho c}\frac{\partial}{\partial y}\left[\underbrace{-k\frac{\partial \overline{T}}{\partial y} + \frac{\rho c}{t_{int}}\int_0^{t_{int}} v' T' \, dt}_{\text{apparent heat flux, } \dot{q}_{app}}\right] \tag{4-361}$$

31. Equation (4-383) should be:

$$\underbrace{-\frac{\rho}{t_{int}}\int_0^{t_{int}} u' v' \, dt}_{\text{Reynolds stress}} \propto \frac{\partial \overline{u}}{\partial y} \tag{4-383}$$

32. The sentence after Eq. (4-383) should read:

The constant of proportionality that makes Eq. (4-383) an equality is used to define the eddy diffusivity of momentum (ε_M):

33. Equation (4-384) should be

$$-\frac{\rho}{t_{int}}\int_0^{t_{int}} u' v' \, dt = \rho\,\varepsilon_M \frac{\partial \overline{u}}{\partial y} \tag{4-384}$$

34. Equation (5-51) should be

$$\frac{x_{fd,t,lam}}{x_{fd,h,lam}} = Pr \tag{5-51}$$

35. (Scott Schuetter, UW, 6-17-09), Equation (3) in EXAMPLE 3.1-1 on pg. 309 should be

$$\int_{T_{ini}}^{T} \frac{dT}{\left(T - T_\infty\right)} = -\int_0^t \frac{dt}{\tau_{lumped}} \tag{3}$$

36. (Matthew Wilfong, UW, 6-28-09), The value of T_∞ in Figure P1-20 on pg. 200 should be 20ºC in order to match the text.

37. (Scott Schuetter, UW, 6-26-09), The equation for the heat transfer from an adiabatic tip fin in Table 1-4 (the first entry) on pg. 104 should read:

$$\dot{q}_{fin} = \left(T_b - T_\infty\right)\sqrt{\overline{h}\ per\ k\ A_c}\ \tanh\left(m\,L\right)$$

The variable T_f should be T_∞.

38. (Scott Schuetter, UW, 7-8-09). Eqs. (6-41) through (6-44) should read:

$$\tilde{u}\frac{\partial \tilde{u}}{\partial \tilde{x}} + \tilde{v}\frac{\partial \tilde{u}}{\partial \tilde{y}} = \frac{\left(T - T_\infty\right)}{\left(T_s - T_\infty\right)} + \underbrace{\frac{\upsilon}{L\sqrt{g\,L\,\beta\left(T_s - T_\infty\right)}}}_{=Gr_L^{-1/2}}\frac{\partial^2 \tilde{u}}{\partial \tilde{y}^2} \tag{6-41}$$

$$\tilde{u}\frac{\partial \tilde{\theta}}{\partial \tilde{x}} + \tilde{v}\frac{\partial \tilde{\theta}}{\partial \tilde{y}} = \underbrace{\frac{\mu}{\rho\sqrt{g\,L\,\beta\left(T_s - T_\infty\right)}\,L\,Pr}}_{=Gr_L^{-1/2}\ Pr^{-1}}\frac{\partial^2 \tilde{\theta}}{\partial \tilde{y}^2} \tag{6-42}$$

$$\tilde{u}\frac{\partial \tilde{u}}{\partial \tilde{x}} + \tilde{v}\frac{\partial \tilde{u}}{\partial \tilde{y}} = \tilde{\theta} + \frac{1}{Gr_L^{1/2}}\frac{\partial^2 \tilde{u}}{\partial \tilde{y}^2} \tag{6-43}$$

$$\tilde{u}\frac{\partial \tilde{\theta}}{\partial \tilde{x}} + \tilde{v}\frac{\partial \tilde{\theta}}{\partial \tilde{y}} = \frac{1}{Gr_L^{1/2}\ Pr}\frac{\partial^2 \tilde{\theta}}{\partial \tilde{y}^2} \tag{6-44}$$