

# Errata Sheet for *Fluid Mechanics: Fundamentals and Applications, Ed. 2* – Çengel and Cimbala

Latest update: 11/05/2012

This is a list of errors (and *enhancements*) in the textbook. If you find any additional errors in the book, or have suggestions for improvement, please contact **John M. Cimbala** at **814-863-2739** or **jmc6@psu.edu** to report it. [By way of acknowledgment, the person (other than the authors) who first reports an error is listed in brackets, unless requested otherwise.]

**Note:** First check the copyright page to see which printing you have. At the time of this writing, there have been *three* printings. As new printings are made, the errors and enhancements from previous printings will have been fixed. The errors are listed according to printing number in reverse chronological order to save you time.

For each printing, we categorize the changes as *major errors*, *minor errors*, or *enhancements*:

- **Major errors** are important and significant (e.g., incorrect equations or numerical values) – *these must be changed*.
- **Minor errors** are spelling or typo errors and other minor changes – *these may be skipped without impacting understanding of the material*.
- **Enhancements** are changes that clarify something and/or help you to understand the material better (e.g., improvements to a figure or wording changes) – *these may be skipped since they are not really errors, but are useful changes that enhance understanding of the material*.

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**Corrections in the third printing** – “3 4 5 6 7 8 9 0 DOW/DOW 0” on the copyright page. These will be corrected in the 4<sup>th</sup> printing, if there is a 4<sup>th</sup> printing. Make these changes *only* if you have the 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> printing of the book.

## Major Errors in the Third Printing

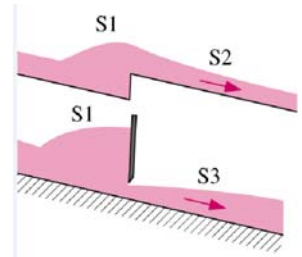
- p. 54, The viscosity for glycerin in Table 2-3 and in Fig. 2-26 do not match: We traced the problem to the figure. The data in the table are correct – the curve on the figure is incorrect. Users are advised to use the tabulated data for all fluids, and not to rely on the figure, which is meant to be used for qualitative comparison only. [Hesham Othman]
- p. 65, Prob. 2-38, lines 1 and 3 [2 identical errors in this problem]: Change “decreases” to “increases” and “decrease” to “increase”. [Nikki Aaron]
- P. 201, Fig. 5-28: Change the dimension in the middle from  $\rho \frac{V^2}{2}$  to  $\frac{V^2}{2g}$ .
- P. 213, Fig. 5-47: The label for  $W_{\text{shaft, in}}$  is missing a dot. Should be  $\dot{W}_{\text{shaft, in}}$ .
- p. 409, Prob. 8-94: In reality, the hose should go into the top of the tanker, not the middle. [Tahsin Engin]
- p. 597, Top right portion of Table 11-2: The two drag coefficients for the front and rear bicycles are listed backwards. The front one should have  $C_D = 0.9$ , and the back one  $C_D = 0.5$ . [Nurudin Abd Sathar]
- p. 727, Table 13-3: The first (top) figure on the left is the wrong figure. Somehow it got misplaced from the first edition. Replace that figure with the correct figure from Ed. 1, p. 705 (the second figure from the top, on the left side. I show it here as well. [Marie-Amélie Boucher]
- p. 768, Eq. (1): Do not cross off the term  $(z_2 - z_1)$  – it is *not* negligible in this problem. Also, remove the bracket and the description “negligible for gases” [Alistair Sproul]. The modified Equation (1) should look like this:

$$H_{\text{required}} = \frac{P_2 - P_1}{\rho g} + \frac{\alpha_2 V_2^2 - \alpha_1 V_1^2}{2g} + (z_2 - z_1) + h_{L, \text{total}} \quad (1)$$

- p. 768, the four lines above Eq. 2: Change the two sentences above Eq. 2 from “At point 1, ... reduces to” to “At point 1, we let  $P_1 = P_{\text{atm}}$ . At point 2,  $P_2$  is then equal to  $P_{\text{atm}} - \rho g(z_2 - z_1)$  since the jet discharges into stagnant outside air at higher elevation  $z_2$  on the roof of the building. Thus, the pressure terms cancel with the elevation terms, and Eq. 1 reduces to”. [Alistair Sproul]
- p. 779, Fig. 14-28: Change the label in the figure from “Increasing velocity” to “Increasing viscosity”. [Hesham Othman]

## Minor Errors in the Third Printing

- p. vi of the front matter – the page “About the Authors”: In line 2 of the paragraph about John M. Cimbala, “University” is spelled wrong.
- p. 41, 3<sup>rd</sup> line of paragraph beginning with “The **vapor pressure**...”: Add a period after “(Fig. 2-7)”. [Yun-Ho Choi]
- p. 69, Prob. 2-93: Change “**2-93C**” to “**2-93**”.
- p. 71, Prob. 2-122, line 3: Change “filed” to “filled”. [Thad Morton]
- p. 246, first full paragraph, line 3: Change “Section 4-5” to “Section 4-6”. [Thad Morton]



- p. 250, Eq. 6-29: Delete “=  $\vec{F}_{\text{body}}$ ” from the equation. [Thad Morton]
- p. 408, Prob. 8-87: Change the first word “Oil” to “Engine oil”. [Tahsin Engin]
- p. 690, Ref. 7. Change the website URL for NACA Report 1135 to “hdl.handle.net/2060/19930091059”. [Gary Settles]
- p. 913, Prob. 15-40, line 6: Change “compare with” to “compare” (remove the word “with”).
- p. 920, 6<sup>th</sup> line of Prob. 15-92: Change “ $v$  as a function” to “ $v$  as a function”. In other words, change the font from the italic vee ( $v$ ) to a script italic vee ( $v$ ) since the italic  $v$  looks too much like a Greek nu ( $\nu$ ). Note:  $v$  is the symbol we use for the y-component of velocity as in Eq. 9-17 on page 427.

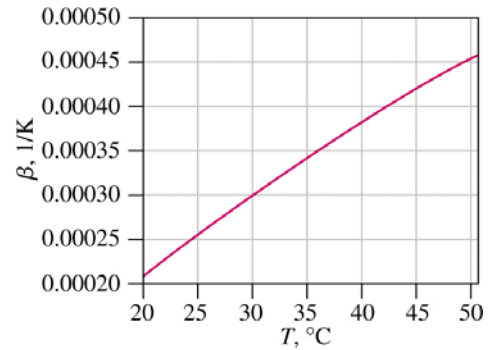
#### **Enhancements to the Third Printing**

- p. 459, 4<sup>th</sup> line of second paragraph: Change “flat, surface” to “flat and surface”. [Yun-Ho Choi]

**Corrections in the first printing (March 27, 2009) and second printing** – either “1 2 3 4 5 6 7 8 9 0 DOW/DOW 0 9” on the copyright page or “2 3 4 5 6 7 8 9 0 DOW/DOW 0 9” on the copyright page. These were corrected in the 3<sup>rd</sup> printing. Make these changes *only* if you have the 1<sup>st</sup> or 2<sup>nd</sup> printing of the book.

### **Major Errors in the First and Second Printing**

- p. 48, Figure 2-14: Somehow the wrong figure ended up here. Replace with Fig. 2-10 of Ed. 1, also shown here to the right. [WoonJean Park]
- p. 63, Prob. 2-14, line 1: Change “The in” to “The pressure in”. [Jim Brasseur]
- p. 65, Prob. 2-41, line 1: Change “100” to “95” in order to agree with the solutions manual and the given answer. [Ziliang Zhou]
- p. 67, Prob. 2-82, 5<sup>th</sup> line: Change “P2-49” to “P2-81”. [Mehmet Kanoglu]
- p. 71, Prob. 2-119E, Answers: Change “0.087 in” to “0.874 in”. [Mehmet Kanoglu]
- p. 79, Fig. 3-12: Change label “ $W=rghA$ ” to “ $W=\rho ghA$ ”. [WoonJean Park]
- p. 90, Fig. 3-29: Fig. is missing the “O” on the top – at the beginning of the  $z$  axis. [Thad Morton]
- p. 102, Fig. 3-49: In the second and third sketches, the black dot should be at the arrow tip, just to the left of the B in each case, as in the first sketch. [Thad Morton]
- p. 112, Prob. 3-21, Answer: Change “974 m” to “934 m”. [Mehmet Kanoglu]
- p. 116, Prob. 3-50, Answer: Change “5.00” to “1.34”. [Mehmet Kanoglu]
- p. 117, Prob. 3-54, Answers: Change “0.415 kPa, 0.311 cm” to “1.60 kPa, 1.20 cm”. [Mehmet Kanoglu]
- p. 120, Prob. 3-87, last line: Change “11.4 kN” to “33.4 kN”. [Mehmet Kanoglu]
- p. 121, Prob. 3-98, Answer: Change “1.05 m” to “1.31 m”. [Mehmet Kanoglu]
- p. 124, Fig. P3-125: Change “r” to “ $\rho$ ” in two places on the label inside the balloon. [WoonJean Park]
- p. 126, Prob. 3-142, Answer: Change “0.233 L” to “0.157 L”. [Mehmet Kanoglu]
- p. 127, Prob. 3-148: Add a dimension to the figure showing 65 cm as the oil depth. [Mehmet Kanoglu]
- p. 180, Prob. 4-119, 5<sup>th</sup> line: Change “Fig. P4-99” to “Fig. P4-119”; and 6<sup>th</sup> line: Change “Prob. 4-97” to “Prob. 4-117”. [Mehmet Kanoglu]
- p. 194, Fig. 5-17: Change symbol “ $\times$ ” to symbol “ $\approx$ ” (approximately equal) in three places. [Yun-Ho Choi]
- p. 224, right in the middle, far right: Change “Fig. 5-56” to “Fig. 5-60”. [Yun-Ho Choi]
- p. 228, Prob. 5-11, Answers: Change the answers to “0.00467 kg/s, 0.0569 m”. [Mehmet Kanoglu]
- p. 234, Prob. 5-82, Answers: Change “1.20 m” to “1.18 m”. [Mehmet Kanoglu]
- p. 236, Prob. 5-97, Answer: Change “201 kW” to “199 kW”.
- p. 237, Prob. 5-111, last line: Change “5” to “6.5” (otherwise the required head is negative!). [Mike Foster]
- p. 238, 3<sup>rd</sup> line from bottom: Change “\*.cvs” to “\*.csv” (comma separated values). [Yun-Ho Choi]
- p. 272, Prob. 6-21, Answers: Change “7.80 kPa” to “7.85 kPa”. [Mehmet Kanoglu]
- p. 272, Figure P6-23: Add “30.0 kg/s” to the label just below the word “Water”. [Ziliang Zhou]
- p. 272, Prob. 6-27E, line 2: Change “20 ft/s” to “18 ft/s”. [Jim Brasseur]
- p. 272, Prob. 6-27E, line 6: Change “determine” to “and approximating the flow as uniform at any cross section, determine”. [Ziliang Zhou]
- p. 278, Prob. 6-77, Answers: Change “Answers: 2120 N” to “Answer: 1770 N”. [Mehmet Kanoglu]
- p. 279, Prob. 6-80, Answers: Change to “(a) 17.1 m/s, (b) 4.37 s, 4.57 m/s, (c) 1.07 m, 0.933 s”. [Mehmet Kanoglu]
- p. 308, line 2 of middle paragraph: Change “224 mi/h” to “221 mi/h”. [Mehmet Kanoglu]
- p. 334, Prob. 7-115, Answer: Change “(a)  $D^4 \delta P / \rho V^2 =$ ” to “(a)  $D^4 \delta P / \rho \dot{V}^2 =$ ” (the V font should be a volume font with an overdot (volume flow rate), not a velocity font).
- p. 360, Eq. 8-53, second term inside the square brackets: Change font from a script vee ( $v$ ) to a Greek nu ( $\nu$ ) as in Eq. 8-52 above it. [Mike Foster]
- p. 404, Prob. 8-41, Answer: Change “6.96 W” to “7.00 W”. [Mehmet Kanoglu]
- p. 404, Prob. 8-47, Answers: Change “128 Pa” to “124 Pa”.
- p. 405, Prob. 8-62, Answers: Change “25.0 kPa” to “25.4 kPa”. [Mehmet Kanoglu]
- p. 409, Prob. 8-97, last line: Delete the last sentence, “Assume ... rough”. [Mike Foster]
- p. 413, Prob. 8-131, last line: Remove “, and the head loss” (we do not have the information to solve for head loss).
- p. 415, Prob. 8-151, 5<sup>th</sup> line: Change “70 m” to “115 m” (This change is necessary to avoid a negative value for the turbine head.). [Mehmet Kanoglu]
- p. 482, Prob. 9-71E, Answers: Change “0.78 ft/s” to “0.99 ft/s” in two places (both answers).
- p. 485, Prob. 9-95, 2<sup>nd</sup> line: Change “Fig. P9-89” to “Fig. P9-95”. [Mehmet Kanoglu]
- p. 486, Prob. 9-105, 1<sup>st</sup> line: Change “Prob. 9-94” to “Prob. 9-103”. [Mehmet Kanoglu]



- p. 493, Eq. 10-1: The equation is missing! It should be " $\vec{\nabla} \cdot \vec{V} = 0$ " [Mehmet Kanoglu]
- p. 592, line 3: Change "friction drag" to "pressure drag". [Tahsin Engin]
- p. 597, Table 11-2, entry for drafting bikes (top right): Exchange " $C_D = 0.5$ " and " $C_D = 0.9$ " (the higher drag coefficient should be for the upstream bicycle, and the lower one for the downstream bicycle). [Yun-Ho Choi]
- p. 623, Prob. 11-29E, Answer: Change "4640 lbf" to "2690 lbf". [Ashley Giegel]
- p. 630, Prob. 11-101, Answers: Change "94 km/h" to "110 km/h".
- p. 646, line 2: Change "12-3" to "12-2". [Yun-Ho Choi]
- p. 690, line 3: Change "channel" to "duct". [Yun-Ho Choi]
- p. 691, Prob. 12-23, Answers: Change "578 K, 969 kPa" to "570 K, 957 kPa". [Mehmet Kanoglu]
- p. 691, Prob. 12-29E, Answers: Change to "958 ft/s, 856 R, 34.7 psia, 0.109 lbm/ft<sup>3</sup>". [Mehmet Kanoglu]
- p. 692, Prob. 12-42, Answers: Change to "359 K, 348 kPa, 0.573". [Mehmet Kanoglu]
- p. 696, Prob. 12-116, Answers: Change "0.624 kg/s" to "0.0624 kg/s". [Mehmet Kanoglu]
- p. 696, Prob. 12-123: Add a "laptop EES" icon to this problem like the problem before. [Mehmet Kanoglu]
- p. 697, Prob. 12-127, 2<sup>nd</sup> line: Change "0.6" to "0.5". [Mehmet Kanoglu]
- p. 697, Prob. 12-129, Answer: Change "67.1°C" to "67.0°C". [Mehmet Kanoglu]
- p. 698, Prob. 12-152, 5<sup>th</sup> line: Change "97 kPa" to "87 kPa". [Mehmet Kanoglu]
- p. 698, Prob. 12-158, Answer: Change "64.3" to "28.2".
- p. 749, line 3 of Problem 13-19: Change "1.030" to "1,030" (comma instead of period). [Yun-Ho Choi]
- p. 751, Prob. 13-55, Answer: Change "3.74 m" to "5.61 m". [Mehmet Kanoglu]
- p. 751, Prob. 13-60, Answer: Change "9.20" to "5.08". [Mehmet Kanoglu]
- p. 752, Fig. P13-65: Wrong figure. The correct one is Fig. P13-122 from FM 1<sup>st</sup> edition. [Mehmet Kanoglu]
- p. 757, Fig. P13-131: Change the label from " $R = 1$  m" to " $R = 0.5$  m". [Mehmet Kanoglu]
- p. 757, Prob. 13-133, Answer: Change "0.246" to "0.123". [Mehmet Kanoglu]
- p. 758, Prob. 13-142, Answers: Change "0.0103 and 1.47" to "0.0215 and 0.657". [Mehmet Kanoglu]
- p. 802, Figure 14-72, top item: Change "3.568" to "3.658".
- p. 834, 1<sup>st</sup> line below Eq. 14-65: Change "Eq. 14-51" to "Eq. 14-65". [WoonJean Park]
- p. 842, Prob. 14-37, 8<sup>th</sup> line: Change "P14-34" to "P14-37". [Mehmet Kanoglu]
- p. 851, Prob. 14-124, 2<sup>nd</sup> line: Change "14-124" to "14-123". [Mehmet Kanoglu]
- p. 861, line 3: Change "Fig. 5-11b" to "Fig. 5-12b". [Yun-Ho Choi]
- p. 886, 3<sup>rd</sup> line of second-to-last paragraph: Change "Fig. 15-60" to "Fig 15-58". [Yun-Ho Choi]
- p. 909, 1<sup>st</sup> line of Prob. 15-17: Change "Prob. 15-15" to "Prob. 15-16". [Yun-Ho Choi]
- p. 911, 6<sup>th</sup> line of Prob. 15-30: Change "Fig. P15-26b" to "Fig. P15-27b". [Yun-Ho Choi]
- p. 913, Prob. 15-40, line 3: Change the problem statement from the third line to the end of the problem statement, i.e., change "but with the... Discuss." to "but with your choice of a "pressure outlet" boundary condition or an "outflow" boundary condition. Run both cases, record  $P_{in}$  and  $P_1$ , calculate  $\Delta P = P_{in} - P_1$ , and compare the two results. Discuss."
- p. 920, 6<sup>th</sup> line of Prob. 15-92: Change "y as a function" to "v as a function". [Yun-Ho Choi]
- p. 957, 6<sup>th</sup> line of entry **fluid particle/element**: Change " $t_{particle}$ " to " $z_{particle}$ ". [Yun-Ho Choi]
- p. 957, 5<sup>th</sup> and 6<sup>th</sup> lines of entry **fluid particle/element**: Change " $y_{particle}(t), z_{particle}(t)$ " to " $y_{particle}(t), z_{particle}(t)$ " (remove the extraneous blank spaces so that it is of the same format as " $x_{particle}(t)$ " on the 5<sup>th</sup> line).

### Minor Errors in the First and Second Printing

- p. vi, About the Authors, 2<sup>nd</sup> paragraph, 2<sup>nd</sup> line: Change "4th edition (2002)" to "6th edition (2008)". [Mehmet Kanoglu]
- p. vi, About the Authors, 2<sup>nd</sup> paragraph, 3<sup>rd</sup> and 4<sup>th</sup> lines: Change "2nd edition (2003)" to "3rd edition (2008)". [Mehmet Kanoglu]
- p. xiii, Add another entry between TABLE A-11 and A-13: "FIGURE A-12 The Moody Chart 934". [WoonJean Park]
- p. xiii, entry for TABLE A-16: Change "Fanno flow" to "Fanno Flow". [WoonJean Park]
- p. 7, 6<sup>th</sup> line from bottom: Change "1623– 1662" to "1623–1662" (remove the extra blank space). [Yun-Ho Choi]
- p. 35, line above Prob. 1-59: Change "Problem" to "Problems".
- p. 41, line 2 of Example 2-1: Change "Fig. 2-4" to "Fig. 2-6". [WoonJean Park]
- p. 50, Section 2-6 caption: Add a gray square dot between "2-6" and "VISCOSITY". [WoonJean Park]
- p. 56, two lines below the last equation: Change "inter-preted" to "interpreted" (remove the dash). [WoonJean Park]
- p. 63, Prob. 2-12, Answers: Change "126 kg" to "125 kg". [Mehmet Kanoglu]
- p. 64, Prob. 2-15: Change problem number "2-15" to "2-15E". [Mehmet Kanoglu]
- p. 65, Prob. 2-48, 2<sup>nd</sup> line: Change "1/T" to "1/T". [Mehmet Kanoglu]
- p. 82, Discussion, 3<sup>rd</sup> line: Change "kg/m3" to "kg/m<sup>3</sup>". [Mehmet Kanoglu]
- p. 85, Figure 3-22 caption: Change "3-3" to "3-6" (wrong example reference). [Mehmet Kanoglu]
- p. 86, Section title: Change "Measurement. Devices" to "Measurement Devices" (delete the period). [WoonJean Park]
- p. 116, Prob. 3-51: Delete the FlowLab icon – this is not a FlowLab problem. [Mehmet Kanoglu]

- p. 120, Prob. 3-86, line 3: Change “1.25 m)” to “1.25 m” (remove the parenthesis). [WoonJean Park]
- p. 130, Prob. 3-167, line 4 from bottom: Change “180<sup>o</sup>” to “180<sup>o</sup>” (add the parenthesis). [WoonJean Park]
- p. 143, last line of caption for Fig. 4-26: Change “Cortesy” to “Courtesy”. [WoonJean Park]
- p. 143, Fig. 4-26 caption: The font for “*Photo from ... NASA*” should be smaller as in other figures. [WoonJean Park]
- p. 168, 1<sup>st</sup> line of reference 4: Add a period after “Cohen”. [Yun-Ho Choi]
- p. 168, Fig. P4-10c: The bottom label should be “Probe”, but it was mistakenly cropped. [WoonJean Park]
- p. 173, Prob. 4-50: This problem is a FlowLab problem and needs the FlowLab icon. [Mehmet Kanoglu]
- p. 191, 6<sup>th</sup> line of Example 5-2: Change “as center” to “center” (remove the word “as”). [Yun-Ho Choi]
- p. 219, Fig. 5-56, 1<sup>st</sup> big equation under the figure: The closing bracket “]” is missing after the  $dA$ . [Mike Foster]
- p. 233, Prob. 2-75: Change problem number “2-75” to “2-75C”. [Mehmet Kanoglu]
- p. 238, Prob. 5-120, line 9: Change “and Plot” to “and Plot” (underline it since it is a mouse click instruction).
- p. 255, line 4: Change “**Analysis** Kinetic energy” to “**Analysis** (a) Kinetic energy”. [WoonJean Park]
- p. 273, Prob. 6-37, Answers: Change “13 percent” to “12.8 percent”. [Mehmet Kanoglu]
- p. 278, Prob. 6-73, Answers: Change “Answers:” to “*Answers:*” (it should be italic). [Mehmet Kanoglu]
- p. 279, Prob. 6-83, line 2: Change “200 N” to “200 N applied continuously for 0.002 s”. [Mehmet Kanoglu]
- p. 283, figure caption: The font for “*Photograph ... permission*” should be smaller as in other figures. [WoonJean Park]
- p. 303, entry for Euler: Change birth year from “1797” to “1707”. [Kasha Kultys]
- p. 316, Fig. 7-43 caption: The font for “*Photograph ... permission*” should be smaller as in other figures. [WoonJean Park]
- p. 316, Fig. 7-43: Add labels “(a)”, “(b)”, and “(c)” below each picture. Also change the figure caption labels from “(a)”, “(b)”, and “(c)” to “(a)”, “(b)”, and “(c)” (make them italic). [Mehmet Kanoglu]
- p. 323, Prob. 7-31, line 4 of column 2: Change “Define” to “We define”. [Mike Foster]
- p. 352, bottom sketch of Fig. 5-56: Add a vertical arrow next to the “ $r$ ” as in the sketch above this one. [Mike Foster]
- p. 353, last line of Fig. 8-22 caption: Change “fluctuation  $v$ .” to “fluctuation  $v$ .” (missing the prime). [Yun-Ho Choi]
- p. 358, 3<sup>rd</sup> line of last bullet item: Change “roughness curves” to “roughness”. [Yun-Ho Choi]
- p. 408, Prob. 8-84, 2<sup>nd</sup> line: Change “Fig. p8-84” to “Fig. P8-84”. [Mehmet Kanoglu]
- p. 453, lines above Eq. 5: Remove “to obtain an expression for  $P(x, y)$ ” (it is redundant). [Yun-Ho Choi]
- p. 470, line above Eq. 9: Change “Eq. 7” to “Eq. 8”. [Yun-Ho Choi]
- p. 531, 5<sup>th</sup> line from bottom: Change “CFO” to “CFD”. [Mike Foster]
- p. 571, Prob. 10-17: Change problem number to “10-17C”. [Mehmet Kanoglu]
- p. 631, Prob. 11-114, 1<sup>st</sup> line: Change “An 9-cm-diameter” to “A 9-cm-diameter”. [Mehmet Kanoglu]
- p. 654, line 2: Change “temperature and pressure” to “pressure and temperature”. [Yun-Ho Choi]
- p. 665, 3<sup>rd</sup> line from bottom: Change “expansion” to “expansion fan”. [Yun-Ho Choi]
- p. 698: Move Fig. P12-147 to right under Prob. 12-147. [Mehmet Kanoglu]
- p. 752, Prob. 13-68E, Answers: Change “16.7” to “16.6”. [Mehmet Kanoglu]
- p. 758, Prob. 13-147, Answer: Change “36.8 percent” to “36.9 percent”.
- p. 807, 3<sup>rd</sup> line of Fig. 14-78 caption: Add a space after the period between the two sentences. [Yun-Ho Choi]
- p. 856, 1<sup>st</sup> line of Fig. 15-5 caption: Change “*Global properties*” to “*Global and integral properties*”. [Yun-Ho Choi]
- p. 873, Fig. 15-36: Add “(c)” below the bottom picture. [Mehmet Kanoglu]
- p. 906, last two lines: Remove the words “In Press,”. [Yun-Ho Choi]
- p. 917, Prob. 15-60: This problem is a FlowLab problem and needs the FlowLab icon.
- p. 982, entry for Moody charts: Change “936” to “934” in three places (wrong page listed). [Thad Morton]

### **Enhancements to the First and Second Printing**

- p. 353, 6<sup>th</sup> line: Change “its average flow velocity” to “the average flow velocity of the layer”. [Mike Foster]