Errata for *Fundamentals of Biomechanics* 3rd edition
by Nihat Özkaya, Margareta Nordin, David Goldsheyder, and Dawn Leger (Springer 2012)

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1. page 15, Problem 2.3, answer (a): $F_{2x} = -7.1 \, N$

2. page 16, Problem 2.8: the mass of the block is $m = 81.6 \, kg$ (not 28.6 kg)

3. page 23, Example 3.1: the net moment $M_{net}$ is 5880 N-m (not 880 N-m). Thanks to Colton Smaldone for catching this error!

4. page 30, Problem 3.1: the net moment $M_O$ is 3979 N-cm (not N-m), so $l = 3.5 \, m$

5. page 30, Problem 3.2: the diving board has mass of 130 kg (not 170 kg)

6. page 32, Problem 3.8: the weight $W_1$ acts at $l_1 = 35 \, cm$ (the subscript is missing). Also, the units on the net moment $M_{net}$ are N-m (not N).

7. page 48, last equation in left column: the angle $\alpha$ made by $R_A$ is computed from

$$\alpha = \arctan \left( \frac{R_{Ay}}{R_{Ax}} \right)$$

8. page 51, Remarks for Example 4.6, two places:

   (a) wrong sign on last term in $M_E$ (left column); the correct moment is:

   $$M_E = aW_2 \hat{i} + \frac{b}{2} W_2 \hat{k}$$

   (b) wrong signs on the last term of $M_{Ax}$ and the first term of $M_{Az}$ (top of right column); the correct reaction moment components are:

   $$M_{Ax} = -\frac{a}{2} W_1 - aW_2 - aP$$
   $$M_{Ay} = 0$$
   $$M_{Az} = -\frac{b}{2} W_2 - bP$$

9. page 56, Problem 4.1: ignore the parenthetical statement at the end of the first paragraph. While the statement is true, it doesn’t simplify the analysis.

10. page 57, Problem 4.6: $M_A = 182.6 \, N-m$ (ccw), not 182.3 N-m.

11. page 57, Problem 4.7: in the problem statement: the free end of the L-shaped beam is point C (not point B). Figure 4.55 is drawn correctly.
12. page 58, Problem 4.8: answers given for $R_{Ay}$, $R_{Az}$, $M_{Ax}$ are incorrect. Correct answers are: $R_{Ay} = P_y (-y)$, $R_{Az} = 0$, $M_{Ax} = aP_y (+x)$. In $M_{Ay}$ remove the semicolon between $a$ and $P_x$.

13. page 58, answer for Problem 4.10: a sign is wrong in the denominator; the correct formula is:

$$P = \frac{\sin \theta + \mu \cos \theta}{\cos \theta - \mu \sin \theta} \ W$$

14. page 58, Problem 4.12: the reaction force is $R_A = 446 \text{ N}$ (not 729 N)

15. page 59, Problem 4.14: the reaction force is $R_A = 188 \text{ N}$ and the reaction moment is $M = 98.0 \text{ N-m}$

16. page 82, in Example 5.6: two places:
   (a) in the left column, the simplified equation for $F_M$ should be:
   $$F_M = \frac{(bW_1 + cW_0) \cos \beta}{a \sin \theta}$$

(b) in the right column,
   i. the angle $\phi$ made by $F_J$ is computed from
   $$\phi = \arctan \left( \frac{F_{Jy}}{F_{Jx}} \right)$$
   ii. correct values are $F_M = 1890 \text{ N}$, $F_J = 1678 \text{ N}$.

17. page 169, Figure 13.2: “GRID” should be “GRIP”.

18. page 172, last paragraph: in the fourth sentence of the paragraph, the definition of shear strain is confusing. This is better: Shear strain is defined as the change in the angle between two initially perpendicular lines. In Figure 13.10 the change is the angle gamma ($\gamma$). We are working with linear elasticity (small deformations), so shear strain is usually very small. Hence the angle can approximated by its tangent, which is the ratio of the lengths $d$ and $l$. Equation 13.4 should read:

$$\gamma \approx \tan (\gamma) = d/l$$

This approximation yields a maximum error of 1% for shear strains below 0.122 radians (7 degrees).

19. page 179, Table 13.2: Shear modulus units should be GPa (not MPa).

20. page 181, deformed length of the steel rod is $l_2 = \ldots = 30(1 + 0.00032) = 30.0096 \text{ cm}$ (add a zero before 32 and 96).

21. page 184, line 2 after Eq. (ix): $R_2$ should be $T_2$ in “$R_A$, $T_1$, and $R_2$”.

22. page 187, answer to Problem 13.5: (e) $\epsilon = 0.02$, not 0.20.

23. page 187, Problem 13.6: to the problem statement add “The load $W_2$ is 400 N”. Also, units in the answer to part (b) should be MPa, not GPa.
24. page 205, caption to Fig. 14.42: “Torque” is misspelled
25. page 205, solution to Example 14.4: reference should be to Figure 14.42, not Figure 14.41
26. page 209: Eq. 14.30 is missing a negative sign. The correct equation is:
   \[ V = -\frac{dM}{dx} \]
27. page 210, Eq. 14.31 is also missing a negative sign. The correct equation is:
   \[ \sigma_x = -\frac{My}{I} \]
28. page 210, last row in Table 14.1: For the annulus (the last row) replace \( Q \) and \( \tau_{\text{max}} \) with:
   \[ Q = \frac{2}{3} \left( r_o^3 - r_i^3 \right) \]
   \[ \tau_{\text{max}} = \frac{4V}{3A} \left( 1 + \frac{r_o r_i}{r_o^2 + r_i^2} \right) \]
29. page 211, right column, second sentence above \( \tau_{\text{max}} \) equation: reference should be to Eq. 14.33, not Eq. 14.19
30. page 215, solution to Example 14.8: incorrect values for \( Q \) and \( \tau_{\text{max}} \) are used (due to the errors in Table 14.1). The correct values are: \( Q = 1.32 \times 10^{-6} \text{ m}^3 \) and \( \tau_{\text{max}} = 2.2 \times 10^6 \text{ Pa} = 2.2 \text{ MPa} \).
31. pages 217-218, Problem 14.2: Two errors:
   - In the problem statement, the force \( F_y \) is also 4 MN, so the third sentence should contain “…such that \( F_x = F_y = 4 \times 10^6 \text{ N} \ldots \)”
   - In the answer to part (b), the \( z \) direction strain is \( \epsilon_z = -0.0270 \) (not -0.0027).
32. page 238, section A.3: reference should be to Figure A.6, not Figure A.4
33. page 240, Example A.2: reference should be to Figure A.8, not Figure A.9
34. page 240, Problem A.2: \( \alpha = 33.2^\circ \), not 32.2\(^\circ\)
35. page 240, Problem A.3: \( c = 22.7 \), not 27.7
36. page 240, Problem A.4: \( a = 10.04 \), not 10.4
37. page 243, Figure B.9: the resultant vector \( \mathbf{D} \) is wrong because the vector \( \mathbf{A} \) is drawn incorrectly (its magnitude is too large). The vector \( \mathbf{D} \) should appear as it does in Figures B.8, B.10, and B.11 since vector addition is commutative.
38. page 247, Examples B.1 and B.2: since the magnitude is $A$ is stated as “5 U”, the units U must carry over to the components of $A$; hence, the solution should say “$A_x = A \cos \alpha = \ldots = 4 \, U$”, and “$A_y = \ldots = 3 \, U$”. The units must also be included on the vector: $\vec{A} = A_x \hat{i} + A_y \hat{j} = 4 \hat{i} + 3 \hat{j} \, U$

Similarly for Example B.2: the units U must be included on vector $\vec{B}$ and its magnitude.

39. page 253, Problem B.7, answer (g): Since these are all magnitudes, remove the underbar:

$E = 3.57, \, F = 8.89, \, G = 2.12, \, H = 7.16$

40. page 253, Problem B.8 answers: since vectors $\vec{A}$ and $\vec{B}$ have units U, both vectors in answer (a) have units U, and the units in answer (b) and (c) should be U$^2$